ALUMINUM BRASS COPPER STAINLESS

Buyers' Stock Catalog and Data Book



CHASE METALS SERVICE

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ALUMINUM BRASS · COPPER STAINLESS

BUYERS' STOCK CATALOG
AND DATA BOOK
No. 63



Chase METALS SERVICE

Chase Metals Service Centers located in Atlanta, Boston, Chicago, Cincinnati, Cleveland, Dallas, Detroit (Madison Heights), Indianapolis, Kansas City, Mo., Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Providence, St. Louis, San Francisco, Waterbury, Conn.









ONE CALL GETS ALL!

WHAT YOU WANT ... WHEN YOU WANT IT

A Buyer's Stock Catalog

and Data Book

ALUMINUM, BRASS, COPPER & STAINLESS



When you need aluminum, brass, copper, bronze or stainless steel in a hurry, it is important to know where you can get it at once. Keep this book handy. It may be the means of preventing clostly delays in your metals procurement. You will also find it a handy every-day reference for data on the metals you use.

This stock catalog and data book lists the wide varieties of stocks of aluminum, brass, bronze, copper and stainless, in a wide range of alloys, sizes, tempers and finishes carried in stock by our 20 Chase Metals Service Centers conveniently located in key industrial centers from coast to coast. Also included in stock are numerous specialities in these metals, such as fasteners, fittings, roofing products, insect wire screening, wire cloth, etc. that you can use in production and for maintenance and construction.

While not all of the Chase Metals Service Centers stock every item listed, the stocks of any location are available to all other Centers on transfer. This means that if your local Chase Service Center does not have a particular item in stock, they can get it for you from another Chase Service Center. With a few exceptions this means no more than an overnight shipment. All Chase Centers are connected by teletype for fast service.

Metallurgical assistance is available on request to assist you in the selection of alloy or temper for any application, and we will be glad to work with you on any production problem involving the use of materials we stock.

For simplified metals purchasing - get all with one call (aluminum, brass, copper, bronze or stainless steel). Call Chase Metals Service-

Your MULTI-METAL Service Center.



SLITTING, SHEARING, SAWING Services . . .

Many Chase Metals Service Centers are equipped with modern cutting facilities, including slitters, shears and saws. With this up-to-date equipment we can give you quick deliveries of the exact widths and lengths of the aluminum, brass, copper, bronze or stainless materials that you need, if your requirements are for other-than-stock sizes.

We will also job cut your own materials — not only metals, but also plastics, fibreboard, screen cloth, etc.



STANDARD TERMS AND CONDITIONS OF SALE

- All orders and contracts are subject to approval by our General Office at Waterbury, Conn.

 The following Terms and Conditions will apply unless shown differently on quotation or invoice.
 - PRICES—All prices quoted by the Chase Metals Service Division of Chase Brass & Copper Co., Inc. are subject to change without notice. Base prices apply to base quantities and except as specifically otherwise provided, are subject to deductions and additions in accordance with schedule in effect on date of shipment of Buyer's order. All base prices are also subject to Seller's published extras with additions thereto or discounts therefrom, and net case charges.
 - 2. TERMS OF PAYMENT:
 - a-As stated on the quotation or invoice.
 - b—All bills will be dated the date of shipment. On accounts not paid within specified number of days from date of shipment, interest will be charged at the rate of 5% per annum, beginning on the first of the month following the date on which payment is due, but no interest amounting to less than \$1 will be charged. Bills for such interest will be rendered monthly.
 - 3. SCRAP-Settlements for scrap returned by customers, subject to same terms as above.
 - 4. TAXES-Federal, State or Municipal Taxes now or hereafter imposed in respect to all sales and/or the production, treatment, manufacture, sale, delivery, transportation or proceeds of the products specified against such sales (except income taxes) will be for account of Buyer, and if paid or required to be paid by Seller the amount thereof will be added to and become a part of the price payable by Buyer.
 - FREIGHT ALLOWANCE—As quoted, except that excess transportation charges assessed by carriers on shipments requiring special equipment in handling or transporting shall be charged to Buyer.
 - Seller will not make any allowance to Buyer for providing his own carriage of a shipment from any point.
 - 5. ACCEPTANCE OF ORDERS—Price lists and discount sheets, if any, are not to be considered as outstanding offers but all orders shall be subject to acceptance by this Company at its Home Office in Waterbury, Connecticut.
 - 7. SPECIAL MATERIAL—If any material shall be manufactured and/or sold by Seller to meet Buyer's particular specifications or requirement and is not part of Seller's standard line offered by it to the trade generally in the usual course of Seller's business, Buyer agrees to defend, protect and save harmless Seller against all suits at law or in equity and from all damage, claims and demands for actual or alleged infringement of any United States or foreign patent and to defend any suit or action which may be brought against Seller for any alleged infringement because of the manufacture and/or sale of the material covered hereby.
 - 8. RESPONSIBILITIES FOR DELAYS—Seller will not be liable for any delay in the performance of orders or contracts or in the delivery or shipment of goods or for any damages suffered by Buyer by reason of such delay, when such delay is, directly or indirectly, caused by or in any manner arises from fires, floods, accidents, riots, war, governmental interference or embargoes, strikes, shortage of labor, fuel, materials or supplies, inadequate transportation facilities or any other cause or causes (whether or not similar in nature to any of those hereinbefore specified) beyond its control.
 - 9. CLAIMS—If material supplied by Seller is defective or fails to meet the specifications accepted by Seller, Buyer shall not return the goods, but shall notify the Seller immediately, stating full particulars in support of his claim and Seller will adjust the matter fairly and promptly. Under no circumstances shall Seller be obligated to allow claims for consequential damages or for any expense incurred by the use of defective or unsatisfactory material.
- INSPECTION CHARGES—When Buyer requires tests or inspections not regularly provided by Seller, Seller will charge Buyer for the actual cost of such tests or inspections.
- SIZES AND TOLERANCES—Materials furnished by Seller are to be within the limits and of the sizes published by Seller and subject to Seller's standard tolerances for variations.
- 12. WEIGHTS AND COUNTS—All weights and counts as shown in our Price Book are theoretical, and commercial variances must be expected in actual practice.
- 13. BOXING CHARGES (ALL PRODUCTS)—No charge will be made for packing or casing any material shipped in standard packages. Where special cases are required, or other than standard packing is necessary, the
 - Where special cases are required, or other than standard packing is necessary, the expense involved shall be charged to Buyer. Excess transportation charge assessed by railroad or steamship companies covering shipments requiring special equipment in handling or transporting shall be charged to Buyer.



ALUMINUM

ROD

BAR

WIRE

SHEET

PLATE

TUBE

PIPE

COLD-HEADING WIRE

SHAPES

SPECIALTIES



CHASE METALS SERVICE

ALUMINUM INDEX

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ALUMINUM ROD-BAR-WIRE



Chase Aluminum Rod-Bar-Wire is stocked in a wide selection of alloys and sizes in rounds, hexagons, squares and rectangles—drawn, cold finished, rolled or extruded.

All standard forms of packaging can be supplied: strapped bundles, spiral wrapped bundles, or fibreboard boxes.

Certification of conformity to alloy composition and temper designations, or to material specifications will be supplied on request.

All shipments are tagged, giving customer's order number, alloy identification, description and net weight.

Standard material in non-stocked alloys, shapes or tempers can be furnished on order, and price and delivery will be quoted on request.



ALUMINUM ROD, BAR AND WIRE

ROUNDS-IN STRAIGHT LENGTHS

S = Screw Machine Stock

X = Standard Stock

All Alloys up to and including 2 3/4"-12-foot stock lengths

Over 2 3/4"-6 to 12-foot random lengths

DRAWN

Dia	ameter	Weight*			Alloy		
	Decimal	Lbs. per	_		Alloy		
	Equivalent	Foot	2011	2017	2024	6061	7075
Inches	Inches	(Approx.)	Т3	T4	T4	T 6	T 6
3/32	.094	.0084			X		
1/8	.125	.0151	S	S	S		
9/64	.141	.0189	X				
5/32	.156	.0234	S	S	X		
1/64	.172	.0283		S			
3/16	.188	.0337	S	S	S	S	
13/64	.203	.0396	S				
7/32	.219	.0460	S	S			
15/64	.234	.0526	S				
1/4	.250	.0600	S	S	S	S	
17/64	.266	.0677	S				
7/32	.281	.0621	S	S			
19/64	.297	.0846	X				
5/16	.313	.0937	S	S	S	S	
11/32	.344	.1134	S	S			
		CO	LD FINISH	IED			
3/8	.375	.1349	S	S	S	S	X
25/64	.391	.1465	S				
13/32	.406	.1582	S	S			
7/16	.438	.1837	S	S	S	S	
15/32	.469	.2109	S	X			
			2011	2017	2024	6061	7075
			T3	T451	T351	T651	T651
1/2	.500	.2398	S	S	S	S	X
17/32	.531	.2707	S	S			X
9/16	.563	.3036	S	S	S	S	
19/32	.594	.3383	S				
5/8	.625	.3748	S	S	S	S	
21/32	.656	.4132	S				
11/16	.688	.4535	S	S	S		X
23/32	.719	.4958	S	S			
3/4	.750	.5398	S	S	S	S	X
25/32	.781	.5856	S	S			
13/16	.813	.6336	S	S	S		
27/32	.844	.6832	X				
7/8	.875	.7347	S	S	S	S	
29/32	.906	.7880	S				
15/16	.938	.8434	S	S	S		

Continued

2017 - 0.99

2024 - 0.98

6061 - 0.96

7075 - 0.99

^{*}Weights given are for Alloy 2011. To find weight of other alloys, multiply weight shown above by conversion factors as follows:





ALUMINUM ROD, BAR AND WIRE

ROUNDS-IN STRAIGHT LENGTHS

S = Screw Machine Stock

X = Standard Stock

All Alloys up to and including 2 3/4"-12-foot stock lengths
Over 2 3/4"-6 to 12-foot random lengths

COLD FINISHED-Continued

Dia	ameter	Weight*			Alloy		
	Decimal	Lbs. per	2011	2017	2024	6061	7075
	Equivalent	Foot	T3	T451	T351	T651	T651
Inches	Inches	(Approx.)	13	1431	1331	1001	1 001
31/32	.969	.9006	X			_	
1	1.000	.9596	S	S	S	S	X
1/16	1.063	1.082	S	S	S		
1/8	1.125	1.214	S	S	S	S	X
3/16	1.188	1.353	S	S	X	X	X
1 7/32	1.219	1.425					X
1 1/4	1.250	1.498	S	S	S	S	X
1 5/16	1.313	1.653	S	S	S	S	
1 3/8	1.375	1.814	S	S	S	S	X
7/16	1.438	1.982	S	S	S		
15/32	1.469	2.070	~	_			X
1 1/2	1.500	2.159	S	S	S	S	X
1/2	1.500	2.200	2				
			ROLLED				
1 9/16	1.563	2.342	S	S	S	X	
1 5/8	1.625	2.533	S	S	S	S	X
11/16	1.687	2.732	S	S	X		
3/4	1.750	2.938	S	S	S	S	X
13/16	1.812	3.152	S	S	X		
1 7/8	1.875	3.373	S	S	S	S	X
15/16	1.938	3.602	S	S	X		
10/10	2.000	3.838	S	S	S	S	X
1/16	2,063	4.082		S	X		
2 1/8	2.125	4.333	S	S	S	S	
2 3/16	2.188	4.592		S	X		
2 1/4	2.250	4.858	S	S	S	S	X
2 5/16	2.313	5.131	S	S	X		
2 3/8	2.375	5.412	S	S	S		
2 7/16	2.438	5.701		S			
2 1/2	2.500	5.997	S	S	S	S	X
2 5/8	2.625	6.611	S	S	S		
2 3/4	2.750	7.256	S	~	S	S	X
2 7/8	2.875	7.931		S	S	X	
3	3.000	8.636	S	S	S	S	X
3.1/4	3.250	10.13			S	S	
3.1/4	3.375	10.93		S	-	_	
	3.500	11.75		X	X	X	X
3 1/2 3 3/4	3.750	13.49		X	X	X	
3 3/4	4.000	15.35		X	X	x	
				X	**		
4 1/4	4.250	17.33		X		X	
4 1/2	4.500	19.43			v	X	
5	5.000	23.98		X	X	X	
5 1/2	5.500	29.11		X	X		
6	6.000	34.54		X	X	X	

^{*}Weights given are for Alloy 2011. To find weight of other alloys, multiply weight shown above by conversion factors as follows:

2017 - 0.99 2024 - 0.98

- 0.98 6061 - 0.96

7075 - 0.99



ALUMINUM ROD, BAR AND WIRE

HEXAGONS-IN STRAIGHT LENGTHS

S = Screw Machine Stock

X = Standard Stock

All alloys up to and including 2''-12-foot stock lengths

Over 2''-6 to 12-foot random lengths

DRAWN

Dia	ımeter	Weight		Alloy		
Inches	Decimal Equivalent Inches	Lbs. per Foot (Approx.)	2011 T3	2017 T4	2024 T4	
			10			
3/16	.188	.0372	C	S	C	
1/4	.250	.0656	S	S	S	
5/16	.313	.1030	S	S		
		COLD I	FINISHED			
3/8	.375	.1488	S	S	S	
7/16	.438	.2026	S	S	S	
			2011 T3	2017 T451	2024 T351	6061 T651
./2	.500	.2648	S	S	S	
0/16	.563	.3348	S	S	S	
5/8	.625	.4133	S	S	S	S
1/16	.688	.5002	S	S	S	
3/4	.750	.5951	S	S	S	S
13/16	.813	.6985	S	S	S	X
7/8	.875	.8100	S	S	S	x
15/16	.938	.9288	S	S	S	S
			S	S	S	S
1 (10	1.000	1.057	S	S	Б	D
1/16	1.063	1.193	S	S	S	S
1/8	1.125	1.337		S	ъ	S
1 3/16	1.188	1.490	X			~
l 1/4	1.250	1.650	S	S	S	S
1 5/16	1.313	1.820	X	S		
1 3/8	1.375	1.998	S	S	S	X
1 7/16	1.438	1.982	X		S	X
1 1/2	1.500	2.377	S	S	S	S
		ROLLED OR C	OLD FINISH	ED		
1 9/16	1.563	2.583			X	X
1 5/8	1.625	2.793	X	S	S	X
1 11/16	1.688	3.013				S
1 3/4	1.750	3.240	S	S	S	
$1 \frac{3}{4}$	1.813	3.476		~	X	
1 7/8	1.875	3.719	x	S	S	
1 15/16	1.938	3.972		X		
2	2.000	4.231	S	S	S	S
2 1/16	2.063	4.504	b	D		X
				x	x	X
2 1/8	2.125	4.778		Λ		A
$2 \ 3/16$	2.188	5.068			X	
21/4	2.250	5.356		S		
2 3/8	2.375	5.968		X		
2 1/2	2.500	6.612		S	S	
2 5/8	2.625	7.290				X
2 3/4	2.750	8.001		S		

^{*}Weights given are for Alloy 2011. To find weight of other alloys, multiply weight shown above by conversion factors as follows:

2017 - 0.99 2024 - 0.98

6061 - 0.96



ALUMINUM ROD, BAR AND WIRE

SQUARES-IN STRAIGHT LENGTHS

X = Stock Sizes

All alloys up to and including 2"-12-foot stock lengths

Over 2"-6 to 12-foot random lengths

COLD FINISHED

Dia	ameter	Weight*		A1	loy	
Inches	Decimal Equivalent Inches	Lbs. per Lin. Ft. (Approx.)	2011 T3	2024 T351	6061 T651	7075 T651
3/8	.375	.1718		x		
7/16	.438	.2339		X		
1/2	.500	.3054	X	X		
9/16	.563	.3866		X		
5/8	.625	.4773		X		
11/16	.688	.5775	X			
3/4	.750	.6872	X X	X		
7/8	.875	.9354	X	X		
1	1.000	1.222		X		X
1 1/8	1.125	1.546		X		
1 1/4	1.250	1.909		X		
1 1/2	1.500	2.749		X	X	X
		ROI	LED			
1 3/4	1.750	3.742		X		X
2	2.000	4.887		X	X	X
2 1/4	2.250	6.185		X		
2 1/2	2.500	7.636		X		
2 3/4	2.750	9.240		X		
3	3.000	10.99		X		
3 1/4	3.250	12.91		X	X	
3 1/2	3.500	14.97		X		

^{*}Weights given are for Alloy 2011. To find weight of other alloys, multiply weight shown by conversion factors as follows:

2024 - 0.98

6061 - 0.96

7075 - 0.99

ALUMINUM FORGING ROD

Class 1 and Class 2

AVAILABLE IN ALL SIZES



ALUMINUM EXTRUDED ROUNDS

Available in all standard alloys, sizes and tempers

ALUMINUM EXTRUDED ROD AND BAR

ALLOY 6063-T5 In 16-foot Exact Lengths

RECTANGLES

		RECIA	MULLED		
Size Inches	Weight Lbs. per Lin. Ft. (Approx.)	Size Inches	Weight Lbs. per Lin. Ft. (Approx.)	Size Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/8 x 1/2 1/8 x 5/8 1/8 x 3/4 1/8 x 1 1/8 x 1 1/4	.074 .094 .112 .150	1/4 x 1/2 1/4 x 5/8 1/4 x 3/4 1/4 x 1 1/4 x 1 1/4	.150 .187 .224 .300 .374	3/8 x 1 1/2 3/8 x 2 3/8 x 3 1/2 x 3/4 1/2 x 1	.676 .900 1.350 .449
1/8 x 1 1/2 1/8 x 1 3/4 1/8 x 2 3/16 x 1/2 3/16 x 3/4	.226 .263 .299 .113 .169	1/4 x 1 1/2 1/4 x 1 3/4 1/4 x 2 1/4 x 2 1/2 1/4 x 3	.450 .526 .600 .750	1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 2 1/2 x 2 1/2 1/2 x 3	.749 .899 1.199 1.500 1.799
3/16 x 1 3/16 x 1 1/4 3/16 x 1 1/2 3/16 x 2 3/16 x 2 1/2	.226 .282 .338 .451 .564	3/8 x 1/2 3/8 x 5/8 3/8 x 3/4 3/8 x 1 3/8 x 1 1/4	.224 .281 .337 .450 .563	3/4 x 1 1/2 3/4 x 2 3/4 x 3 1 x 1 1/2 1 x 2	1.350 1.800 2.700 1.799 2.400

SQUARES

1/2	.300	1 3/	4 .676	1	1 1/4	1.874
5/8	.300 .468	1	4 .676 1.200		1 1/2	2.700

ALUMINUM EXTRUDED ROD AND BAR

In 12-foot Exact Lengths

X = Stock Item

RECTANGLES

Q:	Weight Lbs. per	Alloy					
Size Inches	Lin. Ft. (Approx.)	2024-T3511	6061-T6	7075-T6511			
1/8 x 1/2	.075	X	X				
1/8 x 5/8	.094	X					
1/8 x 3/4	.112	X					
1/8 x 1	.150	X					
1/8 x 1 1/4	.186	X					
1/8 x 1 1/2	.226	X					
1/8 x 2	.299	X					
3/16 x 1/2	.113	X					
3/16 x 3/4	.169	X	X				
3/16 x 1	.226	X	X				
3/16 x 1 1/4	.282		X				
3/16 x 1 1/2	.338	X	X				
3/16 x 2	.451	X					

Continued





ALUMINUM EXTRUDED ROD AND BAR

In 12-foot Exact Lengths

X = Stock Item

RECTANGLES Continued

	Weight Lbs. per		Alloy	
Size	Lin. Ft.			
Inches	(Approx.)	2024-T3511	60 61-T 6	7075-T6511
1/4 x 1/2	.150	X		
$1/4 \times 5/8$.187	X		
1/4 x 3/4	.224	X		
1/4 x 1	.300	X	X	X
1/4 x 1 1/4	.374	X	X	
1/4 x 1 1/2	.450	X	X	x
1/4 x 2	.599	X	X	
1/4 x 2 1/2	.750	X		
1/4 x 3	.900	X	X	X
1/4 x 4	1.200	X		
3/8 x 1/2	.224	X		
3/8 x 5/8	.281	x		
3/8 x 3/4	.337	X		
3/8 x 1	.450	X	X	X
$3/8 \times 1 1/4$.563	X	X	
		X		
$3/8 \times 1 1/2$.676	X	X	
3/8 x 2	.900		Λ	
$3/8 \times 2 \ 1/2$	1.126	X		
$3/8 \times 3$	1.350	X	••	
$3/8 \times 4$	1.800		X	
3/8 x 6	2.700		X	
		2024-T3510	6061-T6511	7075-T6510
$1/2 \times 5/8$.374		X	
$1/2 \times 3/4$.449	X		
$1/2 \times 7/8$.523	X		
1/2 x 1	.599	X	X	
	. 399			
$1/2 \times 1$ $1/4$.749	X	X	
1/2 x 1 1/4			X	х
1/2 x 1 1/4 1/2 x 1 1/2	.749 .899	X	Х	Х
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4	.749 .899 1.049	X X	x x	x
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2	.749 .899 1.049 1.200	X X X X		х
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4	.749 .899 1.049	x x x	х	х
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3	.749 .899 1.049 1.200 1.500	x x x x x	x x	
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2	.749 .899 1.049 1.200 1.500 1.799 2.100	x x x x x x	x x x	x
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400	X X X X X	x x x	
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1	.749 .899 1.049 1.200 1.500 2.100 2.400 .749	X X X X X X	x x x	x
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400	x x x x x x	x x x	x
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1 5/8 x 1 1/2	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400 .749 1.124	x x x x x x x	x x x x	x
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1 5/8 x 1 1/2 3/4 x 1	.749 .899 1.049 1.200 1.500 2.100 2.400 .749 1.124	x x x x x x x	x x x x	x
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1 5/8 x 1 1/2 3/4 x 1 3/4 x 1 1/4 3/4 x 1 1/2	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400 .749 1.124 .900 1.124	x x x x x x x x	x x x x	x
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 x 4 5/8 x 1 5/8 x 1 3/4 x 1 3/4 x 1 3/4 x 1 1/4 3/4 x 1 1/2 3/4 x 1 3/4	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400 .749 1.124 .900 1.124 1.349 1.574	x x x x x x x x x	x x x x	X
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1 5/8 x 1 1/2 3/4 x 1 3/4 x 1 1/4 3/4 x 1 1/2	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400 .749 1.124 .900 1.124 1.349	x x x x x x x x x x	x x x x	X
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1 5/8 x 1 1/2 3/4 x 1 3/4 x 1 1/4 3/4 x 1 1/4 3/4 x 1 3/4 3/4 x 2 3/4 x 2 1/2	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400 .749 1.124 .900 1.124 1.349 1.574 1.800	x x x x x x x x x x x	x x x x	X
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1 5/8 x 1 1/2 3/4 x 1 3/4 x 1 1/4 3/4 x 1 1/4 3/4 x 1 3/4 3/4 x 2 3/4 x 2 1/2 3/4 x 3	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400 .749 1.124 .900 1.124 1.349 1.574 1.800 2.250 2.700	x x x x x x x x x x x x	x x x x	X X
1/2 x 1 1/4 1/2 x 1 1/2 1/2 x 1 3/4 1/2 x 2 1/2 x 2 1/2 1/2 x 3 1/2 x 3 1/2 1/2 x 4 5/8 x 1 5/8 x 1 1/2 3/4 x 1 3/4 x 1 1/4 3/4 x 1 1/4 3/4 x 1 3/4 3/4 x 2 3/4 x 2 1/2	.749 .899 1.049 1.200 1.500 1.799 2.100 2.400 .749 1.124 .900 1.124 1.349 1.574 1.800 2.250	x x x x x x x x x x x x x	x x x x	X X

Continued

ALUMINUM EXTRUDED ROD AND BAR

In 12-foot Exact Lengths

X = Stock Item

RECTANGLES Continued

	Weight Lbs. per		Alloy	
Size Inches	Lin. Ft. (Approx.)	2024-T3510	6061-T6511	7075-T6510
1 x 1 3/4	2.100	X		X
1 x 2	2.399	X		X
1 x 2 1/2	2.999	X		
1 x 3	3.600	X		X
1 x 3 1/2	4.199	X	X	
1 x 4	4.799	X	X	
1 x 6	7.200	X		
1 1/4 x 1 1/2	2.249	X		
1 1/4 x 2	2.999	X	X	
1 1/4 x 2 1/2	3.750	X		
1 1/4 x 3	4.499	X		
1 1/2 x 2	3.599	X		
1 1/2 x 2 1/2	4.499	X		
1 1/2 x 3	5.400	X		
1 1/2 x 4	7.200	X		
1 3/4 x 2	4.198	X		
1 3/4 x 3	6.299	X		
1 3/4 x 4	8.399	X		
2 x 2 1/4	5.399	X		
2 x 2 1/2	5.999	X		
2 x 3	7.199	X		
2 x 4	9.600	X		
2 1/4 x 4	10.800	X		
2 1/2 x 3	8.999	X		
2 1/2 x 3 1/2	10.500	X		
2 1/2 x 4	11.999	X		
2 3/4 x 4	13.199	X		
3 x 4	14.399	X		
3 x 5	17.998	X		
3 x 6	21.600	X		

RECTANGULAR ALUMINUM BUS BAR

6061-T62 (57% Conductivity)

Full Round Edge In 14-foot Stock Lengths

Size Inches	Weight Lbs. per Lin. Ft. (Approx.)	Size Inches	Weight Lbs. per Lin. Ft. (Approx.)	Size Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/4 x 1	0.293	1/4 x 4	1.172	1/4 x 8	2.344
1/4 x 1 1/2	0.439	1/4 x 5	1.465	3/8 x 6	2.637
1/4 x 2	0.586	$1/4 \times 6$	1.758	3/8 x 8	3.515
1/1 + 3	0.879	$1/4 \times 7$	2 051		

Chase can supply, direct from mills, a full line of aluminum bus conductors, cut to length or in long random lengths: FLAT BARS - square, rounded edge, full rounded edge or round corners; ROUND BARS; TUBULAR CONDUCTORS - round or square, large sizes welded; SHAPES - angles and channels and special shapes. Silver plating is available on aluminum conductors, subject to size and/or length.

DATA

CHASE METALS SERVICE



CHASE ALUMINUM*

ROD-BAR-WIRE

TEMPER DESIGNATIONS

F-As Fabricated.

O-Annealed.

H-Strain hardened.

- -The letter "H" is always followed by 2 or 3 digits. The first digit indicates the particular method used to obtain the temper, as follows:
 - H1-means strain hardened only.
 - H2-means strain hardened, then partially annealed.
 - H3-means strain hardened, then stabilized.
- -The temper is indicated by the second digit as follows:
- 2-1/4 hard
- 4-1/2 hard
- 6-3/4 hard
- 8-full hard
- 9-extra hard.
- -The third digit, if given, indicates a special control on one phase of the fabrication process.

T-Heat Treated

Heat-treated to produce stable tempers other than —F, —O, or —H, as follows:

- T3-Solution heat treated, then cold worked.
- T36—Solution heat treated, then cold worked (controlled).
 - T4-Solution heat treated, then naturally aged.
 - T5-Artificially aged only.
 - T6-Solution heat treated, then artificially aged.
- T61-Solution heat treated (boiling water quench), then artificially aged.
- T7-Solution heat treated, then stabilized.
- T8-Solution heat treated, cold worked, then artificially aged.
- T81-Solution heat treated, cold worked (controlled) then artificially aged.
- T9-Solution heat treated, artificially aged, then cold worked.
- T91—Solution heat treated, artificially aged, then cold worked (controlled).
- T913-Solution heat treated, artificially aged, then cold worked (controlled).
- T10-Artificially aged, then cold worked.

*Source - Kaiser Aluminum & Chemical Sales, Inc.

ALUMINUM 9.



CHASE ALUMINUM

TYPICAL PROPERTIES*

NOMINAL COMPOSITION OF ROD, BAR, WIRE AND FORGING ALLOYS (1)

Alloy	Copper	Mag- nesium	Silicon	Zinc	Man- ganese	Chromium	Lead	Bismuth	Nickel
EC	EC 99.5% Nominal Aluminum								
1100 1185						Aluminum Aluminum			
2011 2014 2017 2018 2024 2025 2117 2218	5.5 4.4 4.0 4.0 4.5 4.5 2.5 4.0	0.4 0.5 0.6 1.5 0.3 1.5	0.8		0.8 0.5 — 0.6 0.8 —	 	0.5	0.5	2.0 — — — — — 2.0
3003			_		1.2		_	_	
4032 4043	0.9	1.1	12.2 5.0	_	_		_		0.9
5050 5052 5056(2) 5154 5356(4)		1.4 2.5 5.2 3.5 5.2			0.1 0.1	0.25 0.1 0.25 0.1			
6053 6061 6151 6253(2) 6951	0.25 0.28	1.3 1.0 0.6 1.2 0.6	0.7 0.6 1.0 (3) 0.35	2.0		0.25 0.25 0.25 0.25 —			
7075 7079	1.6 0.6	2.5 3.3	_	5.6 4.3	0.2	0.3 0.2			_

⁽¹⁾ Percent of alloying elements-Aluminum and normal impurities constitute the remainder.

⁽²⁾ Alclad 5056 is Clad with 6253 Alloy.

⁽³⁾ Silicon 45-65 percent of magnesium.

⁽⁴⁾ Titanium 0.10%.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.





CHASE ALUMINUM

TYPICAL PROPERTIES*

TYPICAL MECHANICAL PROPERTIES(1) - WROUGHT ALUMINUM ALLOYS

Non-Heat Treatable Alloys

ROD_BAR_WIRE

			R	OD-BAR-	-WIRE			
		Т	ension		Hardness	Shear	Fatigue	Modulus
Alloy and	Streng		2 In	tion in ches cent	Brinell Number	Ultimate Shearing	ance(2)	Modulus(3)
Temper	Ultimate	Yield	1/16 Inch Thick Specimen	1/2 Inch Diameter Specimen	500 Kg Load 10 mm Ball	Strength psi	Limit psi	Elasticity psi
EC-O	12,000	4,000	23(4)	_	_	8,000	-	10.0 x 10 ⁶
EC-H12	14,000	12,000		-		9,000		10.0 x 10 ⁶
EC-H14	16,000	14,000		_	_	10,000	-	10.0 x 106
EC-H16	18,000	16,000	_	_		11,000		10.0 x 106
EC-H19	27,000	24,000	1.5(4)	_		15,000	7,000	10.0 x 10 ⁶
1100-O	13,000	5,000	35	45	23	9,000	5,000	10.0 x 106
1100-H12	16,000	15,000	12	25	28	10,000	6,000	10.0 x 106
1100-H14	18,000	17,000	9	20	32	11,000	7,000	10.0 x 106
1100-H16	21,000	20,000	6	17	38	12,000	9,000	10.0 x 106
1100-H18	24,000	22,000	5	15	44	13,000	9,000	10.0 x 106
3003-O	16,000	6,000	30	40	28	11,000	7,000	10.0 x 10
3003-H12	19,000	18,000	10	20	35	12,000	8,000	10.0 x 10
3003-H14	22,000	21,000	8	16	40	14,000	9,000	10.0 x 10
3003-H16	26,000	25,000	5	14	47	15,000	10,000	10.0 x 10
3003-H18	29,000	27,000	4	10	55	16,000	10,000	10.0 x 106
5050-O	21,000	8,000	24	30	36	15,000	12,000	10.0 x 106
5050-H32	25,000	21,000	9	13	46	17,000	13,000	10.0 x 106
5050-H34	28,000	24,000	8	10	53	18,000	13,000	10.0 x 10
5050-H36	30,000	26,000	7	9	58	19,000	14,000	10.0 x 10
5050-H38	32,000	29,000	6	7	63	20,000	14,000	10.0 x 106
5052-O	28,000	13,000	25	30	47	18,000	16,000	10.2 x 10
5052-H32	33,000	28,000	12	18	60	20,000	17,000	10.2 x 10
5052-H34	38,000	31,000	10	14	68	21,000	18,000	10.2 x 10
5052-H36	40,000	35,000	8	10	73	23,000	19,000	10.2 x 10
5052-H38	42,000	37,000	7	8	77	24,000	20,000	10.2 x 10
5056-O	42,000	22,000		35	65	26,000	20,000	10.3 x 10
5056-H18	63,000	59,000		10	105	34,000	22,000	10.3 x 10
5056-H38	,	50,000	-	15	100	32,000	22,000	10.3 x 10
Alclad								
5056-H39	2 58,000	_	4(4)	_	_	-	-	_
5154-O	35,000	17,000	27	_	58	22,000	17,000	10.2 x 10
5154-H32	39,000	30,000	15		67	22,000	18,000	10.2 x 10
5154-H34	42,000	33,000	13	_	73	24,000	19,000	10.2 x 10
5154-H36		36,000	12	_	78	26,000	20,000	10.2 x 10
5154-H38		39,000	10		80	28,000	21,000	10.2 x 10

- (1) These typical properties are average for various forms, sizes and methods of manufacture, and may not exactly describe any one particular product. Properties listed are for information only and are not guaranteed.
- (2) Based on 500,000,000 cycles of completely reversed stress using the R. R. Moore type of machine and specimen.
- (3) Average of tension and compression moduli. Compression modulus is about 2% greater than tension modulus.
- (4) Elongation per cent in 10 inches.
- *Source Kaiser Aluminum & Chemical Sales, Inc.

CHASE ALUMINUM

TYPICAL PROPERTIES*

TYPICAL MECHANICAL PROPERTIES(1) - WROUGHT ALUMINUM ALLOYS

Heat-Treatable Alloys

ROD-BAR-WIRE

		Tensi	on		Hardness	Shear	Fatigue	Modulus
Alloy		ngth si	2 In	ation in ches cent	Brinell Number	Ultimate	Endur-	
and Temper	mper 1/16- 1/2 inch Load		10 mm	Shearing Strength psi	ance(2) Limit psi	of Elasticity psi		
2011-T3 2011-T8	55,000(4) 59,000	43,000(4) 45,000	_	15 12	95 100	32,000 35,000	18,000 18,000	10.2 x 10 ⁶ 10.2 x 10 ⁶
2014-O 2014-T4 2014-T6	27,000 62,000 70,000	14,000 42,000 60,000	_ _ _	18 20 13	45 105 135	18,000 38,000 42,000	13,000 20,000 18,000	10.6 x 10 ⁶ 10.6 x 10 ⁶ 10.6 x 10 ⁶
2017-O 2017-T4	26,000 62,000	10,000 40,000	_	22 22	45 105	18,000 38,000	13,000 18,000	10.5 x 10 ⁶ 10.5 x 10 ⁶
2018-T61(5)	61,000	46,000	_	12	120	39,000	17,000	10.8 x 10 ⁶
2024-O 2024-T4 2024-T36	27,000 68,000 72,000	11,000 47,000 57,000	20 20 13	22 19	47 120 130	18,000 41,000 42,000	13,000 20,000 18,000	10.6 x 10 ⁶ 10.6 x 10 ⁶ 10.6 x 10 ⁶
2025-T6(5)	58,000	37,000	_	19	110	35,000	18,000	_
2117-T4	43,000	24,000	_	27	70	28,000	14,000	10.3 x 10 ⁶
2218-T72(5)	48,000	37,000	-	11	95	30,000	_	10.8 x 10 ⁶
4032-T6	55,000	46,000	-	9	120	38,000	16,000	
6053-O 6053-T4 6053-T6	16,000 33,000 39,000	7,000 20,000 33,000	=	35 30 20	26 65 80	11,000 20,000 24,000	8,000 13,000 13,000	_ _ _
6151-T6(5)	48,000	43,000	_	17	100	32,000	11,000	_
6061-O 6061-T4 6061-T6	18,000 35,000 45,000	8,000 21,000 40,000	25 22 12	30 25 17	30 65 95	12,000 24,000 30,000	9,000 14,000 14,000	10.0 x 10 ⁶ 10.0 x 10 ⁶ 10.0 x 10 ⁶
7075-O 7075-T6 7079-T6(5)	33,000 83,000 78,000	15,000 73,000 68,000	17 11 —	16 11 12	60 150 —	22,000 48,000 —	23,000	10.4 x 10 ⁶ 10.4 x 10 ⁶

- (1) These typical properties are average for various forms, sizes and methods of manufacture, and may not exactly describe any one particular product. Properties listed are for information only and are not guaranteed.
- (2) Based on 500,000,000 cycles of completely reversed stress using the R. R. Moore type of machine and specimen.
- (3) Average of tension and compression moduli. Compression modulus is about 2% greater than tension modulus.
- (4) Sizes greater than 1 1/2 inches will have strengths slightly lower than these values.
- (5) Properties developed in the final forging after properly forging and heat treating.
- *Source Kaiser Aluminum & Chemical Sales, Inc.





CHASE ALUMINUM

ROD-BAR-WIRE

TYPICAL HIGH TEMPERATURE TENSILE PROPERTIES(1)*

	TTPIC	AL HIC	או ובוע	IPEKAI	OKE IL	IASILE I	KOILI		
	Testing		*** 1 *	F11	A 11	Testing	III 4 i ma a 4 -	Yield	Ele.
Alloy		Ultimate	Yield	Elon-	Alloy		Ultimate		Elon-
and	ature		Strength		and	ature	-	Strength	Percent
Temper	°F	psi	psi	Percent	Temper	°F	psi	psi	
	75	13,000	5,000	45		75	43,000	24,000	27
	300	8,500	4,000	65		300	30,000	17,000	20
1100-O	400	6,000	3,000	70	2117-T4	400	16,000	12,000	35
	500	3,500	2,000	85		500	7,500	5,500	55
	600	2,500	1,500	90		600	4,500	3,500	80
	700	1,500	1,000	95		700	3,000	2,000	110
	75	24,000	22,000	15		75	16,000	6,000	40
	300	17,500	13,000	16		300	11,000	5,000	47
1100-H18	400	6,000	3,000	70	3003-O	400	8,500	4,500	50
	500	3,500	2,000	85		500	6,000	3,500	60
	600	2,500	1,500	90		600	4,000	2,500	60
	700	1,500	1,000	95		700	3,000	2,000	60
	75	55,000	43,000	15		75	55,000	46,000	9
	300	28,000	19,000	25		300	38,000	33,000	9
2011-Т3	400	20,000	14,000	35	4032-T6	400	16,000	11,000	30
2011-10	500	9,000	5,000	45	1001	500	8,500	6,500	40
	600	5,000	2,000	90		600	6,000	3,500	50
	700	3,000	1,500	125		700	3,500	2,000	80
	75	70,000	60,000	13		75	28,000	13,000	30
	300	47,000	40,000	15		300	20,000	10,000	55
2014-T6	400	18,000	12,000	35	5052-O	400	15,000	9,000	65
2014-10	500	11,000	8,500	45	0002	500	11,000	7,000	100
	600	6,500	5,000	65		600	7,500	4,500	105
	700	4,500	3,500	70		700	5,000	2,500	120
	75	62,000	40,000	22		75	39,000	33,000	20
	300	40,000	30,000	16		300	26,000	25,000	17
2017-T4	400	22,000	17,000	28	6053-T6	400	14,000	12,000	30
2011-14	500	12,000	9,500	45	0000 10	500	6,000	4,000	70
	600	6,500	5,000	95		600	4,000	2,500	80
	700	4,500	3,500	100		700	3,000	2,000	85
	75	•		12		75	45,000	40,000	17
	300	61,000	46,000 44,000	13		300	32,000	30,000	18
9010 TC1		48,000	17,000	25	6061-T6		19,000	16,000	25
2018-T61	500	21,000 11,000	7,000	40	0001-10	500	7,000	5,000	55
	600	6,000	4,000	60		600	4,000	2,500	90
	700	4,000	2,500	85		700	3,000	2,000	105
								•	17
	75	68,000	47,000	19		75	48,000	43,000	25
0004 574	300	43,000	37,000	17	C1E1 TOC	300	21,000	18,000	58
2024-T4	400	26,000	22,000	22 45	6151-T6		7,500 6,000	6,000 5,000	59
	500	14,000	10,000	75		500 600	4,500	4,000	60
	600 700	7,000 5,000	5,000 3,500	100		700	4,000	3,500	65
							•		
	75	58,000	37,000	19		75	83,000	73,000	11 30
0005	300	36,000	29,000	18	7075 700	300	25,000	21,000	60
2025-T6	400	19,000	14,000	35	7075-T6		14,000	12,000	65
	500	9,000	6,500	50 70		500 600	11,000 8,500	8,500 6,500	80
	600	5,000	4,500					4,500	65
	700	4,000	3,000	80		700	6,500	4,500	03

NOTE: (1) After prolonged heating at the testing temperature.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM

ROD-BAR-WIRE
TYPICAL PHYSICAL PROPERTIES*

Aller		Thermal Conductivity at 25°C (77°F)		Electronic Conduction at 20°C (tivity	Electri Resisti at 20°C (vity
Alloy Temper	CGS Units(2)	English Units(3)	Equal Volume	Equal Weight	Microhms- Centimeter	Ohms- Mil, Foot	
EC(4)	All	.56	1625	62	204	2.8	17
1100	-0	.53	1540	59	194	2.9	1-7
	-H18	.52	1510	57	187	3.0	18
2011	_T3	.34	990	36	113	4.8	29
2014	-0	.46	1340	50	159	3.4	21
	-T4	.29	840	30	95	5.7	35
	-T6	.37	1070	40	127	4.3	26
2017	-0	.41	1190	45	143	3.8	23
	-T4	.29	840	30	96	5.7	35
2018	-T61	.37	1070	40	127	4.3	26
2024	-0	.45	1310	50	160	3.4	21
2021	-T4, T36	.29	840	30	96	5.7	35
2025	-T6	.37	1070	40	127	4.3	26
2117	-T4	.37	1070	40	130	4.3	26
2218	-T72	.37	1070	40	126	4.3	26
3003	-0	.46	1340	50	163	3.4	21
0000	-H12	.39	1130	42	137	4.1	25
	-H14	.38	1100	41	134	4.2	25
	-H18	.37	1070	40	130	4.3	26
4032	-0	.37	1070	40	132	4.3	26
	-T6	.33	960	35	115	4.9	30
5050	All	.46	1340	50	165	3.4	21
5052	All	.33	960	35	116	4.9	30
5056	-0	.28	810	29	98	5.9	36
	-H38	.26	750	27	91	6.4	38
5154	All	.30	870	32	107	5.3	32
6053	-0	.41	1190	45	148	3.8	23
	-T4, T6	.37	1070	40	132	4.3	26
6061	-0	.41	1190	45	148	3.8	23
	-T4, T6	.37	1070	40	132	4.3	26
6151	-0	.50	1450	55	181	3.1	19
	-T4, T6	.41	1190	45	148	3.8	23
7075	-T6	.29	840	30	95	5.7	35

⁽¹⁾ Percentage of the international annealed copper standard.

⁽²⁾ CGS units cal/cm/cn2/°c/sec.

⁽³⁾ English units-BTU/in/ft2/of/hr.

⁽⁴⁾ Electrical conductor grade. 99.5% nominal Aluminum.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.





CHASE ALUMINUM

ROD-BAR-WIRE

TYPICAL PHYSICAL PROPERTIES*

Alloy		Density		,		Density Specific Range Gravity (Approx.)		Range	Coefficient of Thermal Expansion per °F (1 Million Times Actual Value)				
	Lbs/Cu In	Lbs/Cu Ft	Gravity	°F	-76°F to 68°F	68°F to 212°F	68°F to 392°F	68°F to 572°F					
EC	.098	169	2.70	1195-1215		13.2	_	_					
1100	.098	169	2.71	1190-1215	12.1	13.1	13.7	14.2					
2011	.102	176	2.82	995-1190	11.8	12.7	_	_					
2014	.101	175	2.80	950-1180	11.9	12.8	13.1	13.6					
2017	.101	174	2.79	955-1185	12.0	13.1	13.3	13.9					
2018	.101	175	2.80	948-1180	11.6	12.4	12.9	13.4					
2024	.100	173	2.77	935-1180	11.9	12.9	13.3	13.7					
2025	.101	174	2.79	970-1185	12.0	12.9	13.2	13.6					
2117	.099	171	2.74	950-1200	12.1	13.2	_	_					
2218	.102	176	2.81	940-1175	11.6	12.4	12.9	13.4					
3003	.099	170	2.73	1190-1210	11.9	12.9	13.4	13.9					
4043	.097	168	2.69	1070-1165	_	_	_	_					
5050	.097	168	2.69	1160-1205	12.2	13.2	13.8	14.3					
5052	.097	167	2.68	1100-1200	12.2	13.2	13.8	14.3					
5056	.095	165	2.64	1055-1180	12.4	13.5	14.1	14.6					
5154	.096	166	2.66	1100-1190	12.2	13.3	13.8	14.4					
6053	.097	168	2.69	1075-1205	12.1	13.1	13.4	13.9					
6061	.098	169	2.70	1080-1200	12.0	13.1	13.5	14.1					
6151	.098	169	2.70	1025-1200	12.0	12.9	13.4	13.9					
6951	.098	169	2.70	1140-1210	_	13.0	_	_					
7075	.101	175	2.80	890-1180	12.0	13.1	13.4	14.4					



CHASE ALUMINUM ROD-BAR-WIRE

SPECIFIED PROPERTIES*

CHEMICAL COMPOSITION LIMITS

(Percent Composition. Maximum unless indicated as a range)

				Man-	Mag-		Chro-		Titan-				ers
Alloy	Copper	Silicon	Iron	ganese	nesium	Zinc	mium	Nickel	ium	Bismuth	Lead	Each	Tota
EC(1)													
1100(2)	0.20	Si + Fe = 1.	0 max.	0.05	-	0.10	-	-	_	_	_	0.05(4)	0.15
2011	5.0-6.0	0.40	0.70	-	-	0.30	_	-	-	0.2-0.6	0.2-0.6	0.05	0.15
2014	3.9-5.0	0.5-1.2	1.0	0.4-1.2	0.2-0.80	0.25	0.10	_	0.15	_	_	0.05	0.15
2017	3.5-4.5	0.8	1.0	0.4-1.0	0.2-0.80	0.25	0.10	_	-	_	_	0.05	0.15
2018	3.5-4.5	0.90	1.0	0.20	0.45-0.9	0.25	0.10	1.7-2.3	0.05	_	_	0.05	0.1
2024	3.8-4.9	0.50	0.50	0.3-0.9	1.2-1.8	0.25	0.10	_	_	-	-	0.05	0.1
2025	3.9-5.0	0.5-1.2	1.0	0.4-1.2	0.05	0.25	0.10	_	0,15	-	_	0.05	0.1
2117	2,2-3,0	0.80	1.0	0.20	0.2-0.5	0.10	0.10	_	_	_	_	0.05	0.1
2218	3.5-4.5	0.45-0.90	0.8	0.20	1.3-1.8	0.25	0.10	1.8-2.3	_	_	_	0.05	0.1
3003	0.20	0.60	0.70	1.0-1.5		0.10	_		_	_	_	0.05	0.1
4032	0.5-1.3	11.0-13.5	1.0	_	0.8-1.3	0.25	0.10	0.5-1.3	0.05	-	_	0.05	0.1
4043	0.30	4.5-6.0	0.8	0.05	0.05	0.10		***	0.20	_	-	0.05	0.1
5050	0.20	0.40	0.7	0.10	1.0-1.8	0.25	0.10	_	_	_	_	0.05	0.1
5052	0.10	Si + Fe = 0.	45 max.	0.10	2.2-2.8	0.10	0.15-0.35	_	_	_	_	0.05	0.1
5056	0.10	0.30	0.40	0.05-0.20	4.5-5.6	0.10	0.05-0.20	_	_	_	_	0.05	0.1
5154	0.10	Si + Fe = 0.	45 max.	0.10	3.1-3.9	0.20	0.15-0.35	_	_	_	_	0.05(4)	0.1
5356	0.10	Si + Fe = 0.	50 max.	0.05-0.20	4.5-5.5	0.10	0.05-0.20	_	0.06-0.20	_	_	0.05(4)	0.1
6053	0.10	(3)	0.35	_	1.1-1.4	0.10	0.15-0.35	_	(5)	_	_	0.05	0.1
6061	0,15-0,40	0.4-0.8	0.70	0.15	0.8-1.2	0.20	0.15-0.35	_	0.15	_	_	0.05	0.1
6151	0.35	0.6-1.2	1.0	0.20	0.45-0.8	0.25	0.15-0.35		0.15	_	_	0.05	0.1
7075	1.2-2.0	0 50	0.70	0.30	2.1-2.9	5.1-6.1	0.18-0.40	_	0.20	_	_	0.05	0.1
7079	0.40-0.8	0.30	0.40	0.10-0.30	2 9-3 7	3 8 4 8	0.10-0.25	wein	0.10	_	_	0.05	0.1

- (1) Electrical conductor aluminum with a nominal 99.5% aluminum is defined by electrical resistivity. No specimen of EC-H19 shall have a volume conductivity less than 61% IACS.
- (2) The minimum aluminum content is 99.0%. For MIL-E-16053, the maximum aluminum content is 99.5%.
- (3) 6053 silicon content will be 45 to 65 percent of magnesium content.
- (4) Beryllium is 0.0005% max. for MIL-E-16053.
- (5) Titanium is 0.15% max. in QQ-A-331.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

CHASE ALUMINUM

ROD-BAR-WIRE

	SP	ECIFIED	MECH	HANICAL	PROPERTI	ES*		
NO	N-HEAT TREA	TABLE A	LLOYS		HEAT-TRE	ATABLE	ALLOY	S
Alloy and Temper	Diameter Inches	Ultimate Strength psi Mini-	Strength psi in 4X Diam-		Diameter Inches	Strength psi Minimum		Elonga- tion(1) in 4X Diam- eter
Temper		mum	Percent Mini- mum	Temper		Ultimate	Yield (1)	Percent Mini- mum
EC-O	0.375	14,000(2)		2011-Т3	0.125-1.500	45,000	38,000	10
1100-O	All	15,500(2)	25	2011-10	1.501-2.000	43,000	34,000	
1100-H12	Up thru 0.374		_		2,001-3.000	42,000	30,000	
1100-H14		16,000	_	2011-T8	0,125-3.250	52,000	40,000	
1100-H16	Up thru 0.374		_	2014 0	Up thru 8.000	25 000(2)	,	12
1100-H18	Up thru 0.374	22,000	_	2014-O 2014-T4	Up thru 6.750		32,000	
1100-F(3)	0.375 & over	_	_	2014-T6	Up thru 6.750	,	55,000	
3003-O	All	19,000(2)	25			· /	,	
3003-H12		17,000	_	2017-O	Up thru 8.000			16
3003-H14	Up thru 0.374		_	2017-T4	Up thru 8.000	55,000	32,000	16
3003-H16	Up thru 0.374		_	2024-O	Up thru 8.000	35,000(2)	_	16
3003-H18	Up thru 0.374		_	2024-T4	Up thru 6.500		40,000	14
3003-F(3)	0.375 & over	_	_	6061-O	Up thru 8.000	22 000(2)		18
5050-O	A11	24,000(2)	25	6061-T4	Up thru 8,000		16,000	
5050-H32	Up thru 0.374		-	6061-T6	Up thru 8,000		35,000	
5050-H34			_	6061-T91	Up thru 0.374		47,000	
5050-H36	Up thru 0.374		_		Up thru 0.374		61,000	
5050-H38			_			_ ′	,	
5050-F(3)		_	_	7075-O	Up thru 8.000 Up thru 4.000		66,000	10
5052-O	All	32,000(2)	25	7075-T6	Up thru 4.000	11,000	66,000	1
5052-U	Up thru 0.374		_					
5052-H34			_		GENERA	LNOTES		
5052-H36			_		02112111			
5052-H38			_	(1) Elonga	tion and yield	strengtl	requi	rements
5052-F(3)		_	_	donot	apply to wire u	inder 0.12	5 in. d	iameter.
5056-O	All	46,000(2)	20	(2) Maxim	ium.			
	Up thru 0.374		_	, ,		1 / 0 /	\ -	- 1:4:-
5056-H12	Up thru 0.374		_		in the anneale			
5056-H32			_		nper of nonhea nnot be closely			
5056-H14	Up thru 0.374	52,000	_		nnot be closely ling to size.	y controlle	eu and \	viii vary
5056-H34	Up thru 0.374	50,000	_	accord	ing to size.			
5058-H18	Up thru 0.374	58,000	_					

41,000(2)

25

5056-H38 Up thru 0.374 55,000 5056-H192 Up thru 0.374 60,000 5056-H392 Up thru 0.374 58,000 5056-F(3) 0.375 & over

5056-H192 Up thru 0.374 52,000

5056-H392 Up thru 0.374 50,000

5154-H32 Up thru 0.374 36,000 5154-H34 Up thru 0.374 39,000 5154-H36 Up thru 0.374 42,000 5154-H38 Up thru 0.374 45,000 5154-F(3) 0.375 & over

Alclad

Alclad

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM ROD-BAR-WIRE*

GOVERNMENT AND AERONAUTICAL MATERIAL SPECIFICATIONS**

Alloy	Product	Military Spec.	Aero Mtl. Spec. (AMS)	Federal Spec.
1100	Rod, Bar & Wire	_	4102	QQ-A-411
	Rivet Wire	MIL-W-7986	7220	-
	Welding Wire	MIL-E-16053	4180	QQ-R-566
2011	Rod, Bar & Wire	_	_	QQ-A-36
2014	Forgings	_	4134, 4135	QQ-A-36'
	Rod, Bar & Wire	_	4121	QQ-A-26
2017	Rod, Bar & Wire	_	4118	QQ-A-35
	Forgings	_	_	QQ-A-36
	Rivet Wire	MIL-W-7986	_	_
2018	Forgings	_	4140	QQ-A-36
2024	Rod, Bar & Wire	_	4120	QQ-A-26
	Rivet Wire	MIL-W-7986	_	_
2025	Forgings	_	4130	QQ-A-36
2117	Rivet Wire	MIL-W-7986	7222	-
2218	Forgings	_	4142	QQ-A-36
3003	Rod, Bar & Wire	MIL-R-1150	_	QQ-A-35
4032	Forgings	_	4145	QQ-A-36
4043	Welding Wire	MIL-E-16053	4190	QQ-R-56
5052	Rod, Bar & Wire	_	4114	QQ-A-31
5056	Rivet Wire	MIL-W-7986	4182	_
5154	Welding Wire	MIL-E-16053	_	_
5356	Welding Wire	MIL-E-16053	_	_
6053	Rod, Bar & Wire	_	_	QQ-A-33
	Rivet Wire	MIL-R-1150	_	_
	Forgings	_	_	QQ-A-36
6061	Rod, Bar & Wire	_	_	QQ-A-32
	Rivet Wire	MIL-R-1150	_	_
	Forgings	_	_	QQ-A-36
6151	Forgings	_	4125	QQ-A-36
7075	Rod, Bar & Wire	_	4122, 4139	QQ-A-28
	Forgings	MIL-A-10600	-	QQ-A-36
7079	Forgings	_	4138	QQ-A-36

^{**}The latest Edition or Revision to these specifications is indicated by a suffix letter or number.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

^{18.} ALUMINUM



CHASE ALUMINUM ROD-BAR-WIRE TOLERANCES*

STANDARD SCREW MACHINE STOCK

SECTIONAL TOLERANCES

ROUND

Diameter	Tolerance
(Inches)	(Inch)
0.125 to 0.500	±0.0015
0.531 to 1.000	±0.002
1.063 to 1.500	±0.0025
1.563 to 2.000	±0.006
2.063 to 3.375	±0.008

HEXAGONAL

Distance between Parallel Faces (Inches)	Tolerance (Inch)
0.187 to 0.500	±.0020
0.563 to 1.000	±.0025
1.125 to 1.500	±.0030

ROLLED AND COLD FINISHED ROD SIZES

COLD FINISHED: Sizes listed from 3/8" through 1 1/2" are furnished cold finished only. ROLLED OR COLD FINISHED: Sizes listed from 1 9/16" through 3" are furnished either rolled or cold finished.

ROLLED: Sizes listed from 3 1/16" through 8" are furnished rolled only.

SECTIONAL TOLERANCES

COLD FINISHED ROD

Diameter	Tolerance
(Inches)	(Inch)
0.375 to 0.500	±0.0015
0.501 to 1.000	±0.002
1.001 to 1.500	±0.0025
1.501 to 3.000	±0.004

ROLLED ROD

Diameter	Tolerance (Inch)				
(Inches)	Plus	Minus			
1.501 to 2.000	0.006	0.006			
2.001 to 3.499	0.008	0.008			
3.500 to 5.000	0.031	0.016			
5.001 to 8.000	0.062	0.031			

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

CHASE ALUMINUM

TOLERANCES- ROUND DRAWN WIRE*

SECTIONAL TOLERANCES

Diameter (Inches)	Tolerance (Inch)	
0.0126 to 0.0201 0.0202 to 0.0359 0.036 to 0.064 0.065 to 0.374	±0.0005 ±0.0005 ±0.0010 ±0.0015	

STANDARD COILS

Wire Size Range	Inside Diameter	Average Weight
(Inch)	of Coil (1)	per Coil
Incl.—Under	(Inches)	(Pounds)
0.0201-0.034	16	25
0.034 -0.048	16	35
0.048 -0.061 $0.061 -0.162$	16 22	50 75
0.162 -0.251	22 or 30	75 or 110
0.251 -0.375	30	110

(1) These dimensions cover the diameters of the blocks upon which the wire is coiled and are not the true inside diameters of the coils. If wire is coiled on a 16, 22, or 30 inch block, the block diameter will be the nominal diameter of any specific loop but due to the tendency of the loops to slip, a true 16, 22, or 30 inch inside diameter cannot be maintained.

COILED RIVET WIRE AND ROD

SECTIONAL TOLERANCES

Plus	Minus
0.0005	0.0005
0.001	0.0005
0.001	0.001
0.002	0.001
0.002	0.001
0.003	0.001
	0.0005 0.001 0.001 0.002 0.002

COIL SIZES

Rivet wire and rod is furnished in the following standard coil sizes.

Size Range (Inch) Incl.—Under	Coil Diameter(1) (I.D. in Inches)	Average Coil Weight (in Pounds)
0.061-0.162	22	75
0.162-0.185	22 or 30	75 or 110
0.185-0.616	30	110

(1) These dimensions cover the diameters of the blocks upon which the rivet wire or rod is coiled and are not the true inside diameters of the coils. If rivet wire or rod is coiled on a 22" or 30" block the block diameter will be the nominal diameter of any specific loop, but due to the tendency of the loops to slip, a true 22" or 30" inside diameter cannot be maintained.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.





CHASE ALUMINUM

TOLERANCES-SQUARE WIRE AND BAR*

SIZES

DRAWN: Sizes listed from 1/32" through 11/32" are furnished drawn only.

COLD FINISHED: Sizes listed from 3/8" through 1 1/2" are furnished cold-finished only.

ROLLED: Sizes listed from 1 5/8" through 4" are furnished rolled only. Sizes larger than 2" are available in random lengths only.

SECTIONAL TOLERANCES

Distance between	Tolerance
Parallel Faces	(Inch)
DRAWN W	TRE
0.0202-0.0359	<u>+</u> 0.001
0.036 - 0.064	±0.0015
0.065 - 0.374	±0.002
0.275 0.500	+0.002
0.375 -0.500 0.501 -1.000	±0.002 ±0.0025
0.375 -0.500 0.501 -1.000 1.001 -1.500	
0.501 - 1.000	±0.0025 ±0.003
0.501 -1.000 1.001 -1.500	±0.0025 ±0.003

CHASE ALUMINUM

MACHINABILITY RANGE OF ALUMINUM ALLOYS FOR AUTOMATIC SCREW MACHINE OPERATIONS*

(In Per Cent-Based Upon 2011-T3 = 100%)

Alloy and Temper	Brinell Hardness	% Range High Speed Steel Cutters	Alloy and Temper	Brinell Hardness	% Range High Speed Steel Cutters	
1100-0	23	50	3004-H38	77	70 - 80	
1100-H12	28	65 - 75				
1100-H14	32	65 - 75	5050-O	36	50	
1100-H16	38	65 - 75	5050-H34	53	50	
1100-H18	44	65 - 75	5050-H38	63	60	
2011-T3	95	100	5052-O	47	50	
2011-T8	100	100	5052-H32	60	75 - 85	
			5052-H34	68	75 - 85	
2014-O	45	75	5052-H36	73	75 - 85	
2014-T4	105	85	5052-H38	77	60	
2014-T6	135	85				
			5056-O	65	50	
2017-O	45	60	5056-H18	105	60	
2017-T4	105	90	5056-H38	100	60	
2018-T61	120	85 - 95	5083-O	_	50	
2010 101	-20		5083-H113	_	75	
2024-O	47	50				
2024-T4	120	90	6053-O	26	60	
2024-T36	130	90	6053-T4	65	75 - 85	
2021 100	200		6053-T6	80	75 - 85	
2025-T6	110	85				
2020 10			6061-O	30	50	
2117-T4	70	80	6061-T4	65	70 - 80	
2111-11			6061-T6	95	70 - 80	
3003-O	28	50				
3003-H12	35	75 - 85	6063-O	25	60	
3003-H14	40	75 - 85	6063-T5	60	75 - 85	
3003-H16	47	75 - 85	6063-T6	73	75 - 85	
3003-H18	55	75 - 85	6063-T42	42	50	
3000-1110	00					
3004-O	45	50	6151-T6	100	75 - 85	
3004-H32	52	70 - 80				
3004-H34	63	70 - 80	7075-O	60	65	
3004-H36	70	70 - 80	7075-T6	1 50	75 - 85	

Note: The machinability ratings for screw machine alloys are based upon several factors. The type of aluminum alloy used, its temper and chemical composition determines in part the production rate obtainable. Aluminum in numerous alloys can be machined at ultra-high speeds. Few automatics, however, are continuously operated through the tooling cycle at their maximum spindle speeds to obtain the highest surface feet per minute for each operation.

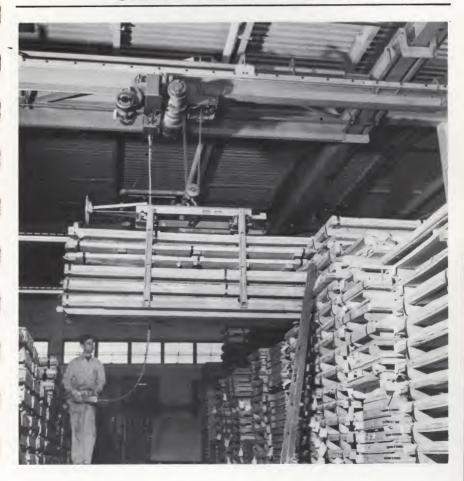
The tooling employed also influences cutting speeds, as does the number of pieces to be run. Any machinability rating for automatics must thus be qualified if it is to be a practical guide to the user. Careful consideration has been given to all influencing factors and the machinability rating suggested is based upon experience, as well as cutting tests.

Percentage rating is based upon 2011-T3 as 100%.

Comparisons are a range.

^{*} Source - "Machining Kaiser Aluminum With Automatic Screw Machines"; Kaiser Aluminum & Chemical Sales, Inc.





ALUMINUM SHEET AND PLATE



Chase Metals Service Centers stock all the common aluminum sheet alloys (both heat treatable and non-heat-treatable) in flat sheets, in a wide range of tempers, sizes and choice of finishes. Sheet is also stocked stencilled, oiled or interleaved.

Coiled sheet and flat plate are also carried in stock.

Heat treatable alloys are generally used where abrasion resistance is an important consideration, such as in transportation and handling equipment, and in construction.

Non-heat-treatable alloys are ideally suited where light reflectivity, electrical conductivity or resistance to chemical corrosion is required. They possess good weldability and good formability and have a pleasing appearance.

Alloys, sizes, tempers and finishes not in stock can be supplied on order. We invite your inquiries.



ALUMINUM FLAT SHEET

ALLOY 1100-0 MILL FINISH

		We	ight	1		We	ight
		Lbs. per	Lbs. per			Lbs. per	Lbs. per
Thickness	Size	Sq Foot	Sheet	Thickness	Size	Sq Foot	Sheet
Inches	Inches	(Approx.)	(Approx.)	Inches	Inches	(Approx.)	(Approx.)
.063	48 x 144	.889	42.67	.032	48 x 144	.452	21.70
.050	48 x 144	.706	33.89	.025	48 x 144	.353	16.94
.040	48 x 144	.564	27.07				
.0.10							
		Α	LLOY 1100-H	14 MILL FINIS			
.125	36 x 96	1.760	42.24	.032	36 x 96	.452	10.85
.125	48 x 144	1.760	84.48	.032	36 x 120	.452	13.56
.090	36 x 96	1.270	30.48	.032	48 x 144	.452	21.70
.080	48 x 144	1.130	54.24	.025	36 x 96	.353	8.47
.063	48 x 144	.889	42.67	.025	48 x 120	.353	10.59
.051	36 x 96	.720	17.28	.025	48 x 144	.353	16.94
.050	36 x 96	.706	16.94	.024	30 x 96	.339	6.78
.050	36 x 120	.706	21.18	.024	36 x 96	.339	8.14
.050	48 x 96	.706	22.59	.024	36 x 120	.339	10.17
.050	48 x 120	.706	28.24	.024	48 x 96	.339	10.85
.050	48 x 144	.706	33.89	.024	48 x 120	.339	13.56
.040	36 x 96	.564	13.54	.020	30 x 96	.282	5.64
.040	36 x 120	.564	16.92	.020	36 x 96	.282	6.77
.040	48 x 96	.564	18.05	.020	36 x 120	.282	8.46
.040	48 x 120	.564	22.56	.019	36 x 96	.268	6.43
.040	48 x 144	.564	27.07	.019	36 x 120	.268	8.04
		4	TLOA 3003-	O MILL FINIS	Н		
.125	36 x 96	1.780	42.72	.050	48 x 144	.713	34.22
.080	48 x 120	1.140	45.60	.040	48 x 144	.570	27.36
.080	48 x 144	1.140	54.72	.032	48 x 144	.456	21.89
.063	48 x 120	.898	35.92	.020	48 x 144	.285	13.68
.063	48 x 144	.898	43.10	I			
		A.I.	LOV 2002 L	I-14 MILL FIN	ICU.		
							45.00
.190	36 x 96	2.71	65.04	.080	48 x 120	1.14	45.60
.190	48 x 144	2.71	130.08	.080	48 x 144	1.14	54.72
.125	36 x 96	1.78	42.72	.071	48 x 120	1.01	40.40
.125	36 x 120	1.78	53.40	.064	36 x 96	.912	21.89
.125	48 x 96	1.78	56.96	.064	36 x 120	.912	27.36
.125	48 x 120	1.78	71.20	.064	48 x 120	.912	36.48
.125	48 x 144	1.78	85.44	.063	36 x 96	.898	21.55
.125	60 x 144	1.78	106.80	.063	36 x 120	.898	26.94
.100	36 x 96	1.43	34.32	.063	48 x 120	.898	35.92
.100	48 x 96	1.43	45.76	.063	48 x 144	.898	43.10
.100	48 x 120	1.43	57.20	.063	60 x 144	.898	53.88
	48 x 120	1.43	68.64		36 x 96	.713	17.11
.100				.050			
.090	36 x 96	1.28	30.72	.050	36 x 120	.713	21.39
.090	48 x 120	1.28	51.20	.050	48 x 96	.713	22.82
.090	48 x 144	1.28	61.44	.050	48 x 120	.713	28.52
.080	36 x 96	1.14	27.36	.050	48 x 144	.713	34.22
.080	36 x 120	1.14	34.20	.050	60 x 144	.713	42.78
.080	48 x 96	1.14	36.48	.040	30 x 120	.570	14.25
				inued			



ALUMINUM FLAT SHEET

ALLOY 3003-H14 MILL FINISH

			Conti	nued			
		We	ight	1			ight
		Lbs. per	Lbs. per		~ .	Lbs. per	Lbs. per
Thickness	Size	Sq Foot	Sheet	Thickness	Size	Sq Foot	Sheet
Inches	Inches	(Approx.)	(Approx.)	Inches	Inches	(Approx.)	(Approx.
.040	36 x 96	.570	13.68	.032	48 x 120	.456	18.24
.040	36 x 120	.570	17.10	.032	48 x 144	.456	21.89
.040	48 x 96	.570	18.24	.025	36 x 96	.356	8.54
.040	48 x 120	.570	22.80	.025	36 x 120	.356	10.68
.040	48 x 144	.570	27.36	.025	48 x 144	.356	17.09
.032	30 x 120	.456	11.40	.020	36 x 96	.285	6.84
.032	36 x 96	.456	10.94	.020	36 x 120	.285	8.55
.032	36 x 120	.456	13.68	,020	48 x 144	.285	13.68
.032	48 x 96	.456	14.59	.016	36 x 120	.228	6.84
		ALLO	Y 3003-H24	ONE SIDE BE	RIGHT		
	00 100			.032	36 x 120	.456	13.68
.064	36 x 120	.912	27.36 17.10	.016	36 x 120	.228	6.84
.040	36 x 120	.570	17.10	.010	30 X 120	.220	0.04
		AL	LOY 3105-H	25 MILL FINIS	БН		
.050	36 x 96	.713	17.11	.032	36 x 120	.456	13.68
.050	36 x 120	.713	21.39	.032	48 x 120	.456	18.24
.050	48 x 120	.713	28.52	.032	48 x 144	.456	21.89
.050	48 x 144	.713	34.22	.024	36 x 96	.343	8.23
.040	36 x 96	.570	13.68	.024	36 x 120	.343	10.29
.040	36 x 120	.570	17.10	.024	48 x 120	.343	13.72
.040	48 x 120	.570	22.80	.024	48 x 144	.343	16.46
.040	48 x 144	.570	27.36	.019	36 x 120	.271	8.13
.032	36 x 96	.456	10.94	l.			
		ALLOY	5005-H34 A	NODIZING C	UALITY		
105	40 100		70.40	.050	36 x 120	.706	21.18
.125	48 x 120	1.76 1.76	84.48	.050	48 x 120	.706	28.24
.125	48 x 144			.050	48 x 144	.706	33.89
.090	48 x 144	1.27	60.96		36 x 120	.564	16.92
.081	48 x 144	1.14	54.72	.040	48 x 120	.564	22.56
.080	48 x 144	1.13	54.24	.040			
.063	36 x 96	.889	21.34	.040	48 x 144	.564	27.07
.063	48 x 120	.889	35.56	.032	36 x 120	.452	13.56
.063	48 x 144	.889	42.67	.032	48 x 120	.452	18.08
.050	36 x 96	.706	16.94				
			ALLOY 5052	-O MILL FINIS	Н		
105	48 x 144	1.750	84.00	.036	48 x 144	.503	24.14
.125	48 x 144 48 x 144	.880	42.24	.032	48 x 144		21.46
.063		.698	16.75	.025	36 x 96	.349	8.38
.050	36 x 96	.698	33.50	.020	36 x 96	.280	6.72
.050	48 x 144			.020	30 A 30	.200	0.12
.040	48 x 144	.559	26.83	1			

ALUMINUM COILED SHEET LISTED ON PAGE 29 THIS SECTION.



ALUMINUM FLAT SHEET

ALLOY 5052-H32 MILL FINISH

		We	ight				ight
		Lbs. per	Lbs. per			Lbs. per	Lbs. per
Thickness	Size	Sq Foot	Sheet	Thickness	Size	Sq Foot	Sheet
Inches	Inches	(Approx.)	(Approx.)	Inches	Inches	(Approx.)	(Approx.)
.190	36 x 96	2.650	63.60	.063	48 x 144	.880	42.24
.190	48 x 144	2.650	127.20	.050	36 x 96	.698	16.75
.125	36 x 96	1.750	42.00	.050	48 x 96	.698	22.34
	48 x 144	1.750	84.00	.050	48 x 120	.698	27.92
.125	48 x 144	1.400	67.20	.050	48 x 144	.698	33.50
					36 x 96	.559	13.42
.090	36 x 96	1.260	30.24	.040			17.89
.090	48 x 96	1.260	40.32	.040	48 x 96	.559	
.090	48 x 144	1.260	60.48	.040	48 x 120	.559	22.36
.080	36 x 96	1.120	26.88	.040	48 x 144	.559	26.83
.080	48 x 96	1.120	35.84	.032	36 x 96	.447	10.73
.080	48 x 144	1.120	53.76	.032	48 x 96	.447	14.30
.063	36 x 96	.880	21.12	.032	48 x 144	.447	21.46
.063	48 x 96	.880	28.16	.025	36 x 96	.349	8.38
		ÅI	10V 5052 L	34 MILL FINI	СП		
.190	48 x 144	2.650	127.20	.050	36 x 96	.698	16.75
.125	36 x 96	1.750	42.00	.050	48 x 96	.698	22.34
.125	48 x 144	1.750	84.00	.050	48 x 120	.698	27.92
.100	48 x 144	1.400	67.20	.050	48 x 144	.698	33.50
.090	36 x 96	1.260	30.24	.040	36 x 96	.559	13.42
.090	48 x 120	1.260	50.40	.040	48 x 144	.559	26.83
.090	48 x 144	1.260	60.48	.032	36 x 96	.447	10.73
.080	48 x 144	1.120	53.76	.032	48 x 144	.447	21.46
.063	36 x 96	.880	21.12	.025	48 x 144	.349	16.75
.063	48 x 120	.880	35.20	.020	36 x 96	.280	6.72
.063	48 x 144	.880	42.24	.020	48 x 144	.280	13.44
			ALLOY 20	4-0 ALCLAD			
.063	48 x 144	.916	43.97	.032	48 x 144	.465	22.32
.050	48 x 144	.727	34.90	.020	48 x 144	.291	13.97
.040	48 x 144	.582	27.94	1			
			ALLOY 201	4-T6 ALCLAD			
	10 1	0.000			40 - 144	797	34.90
.190	48 x 144	2.760	132.48	.050	48 x 144	.727	
.100	48 x 144	1.450	69.60	.040	48 x 144	.582	27.94
.090	48 x 144	1.310	62.88	.032	48 x 144	.465	22.32
.080	48 x 144	1.160	55.68	.020	36 x 144	.291	10.48
.071	48 x 144	1.030	49.44	.020	48 x 144	.291	13.97
.063	48 x 144	.916	43.97				
			ALLOY 2024	O MILL FINIS	Н		
.125	48 x 144	1.80	86.40	.050	48 x 144	.720	34.56
.090	48 x 144	1.30	62.40	.040	48 x 144	.576	27.65
	48 x 144	1.15	55.20	.032	48 x 144	.461	22.13
.080		1.15	48.96	.025	48 x 144		17.28
.071	48 x 144	.907	43.54	.020	48 x 144		13.82
.063	48 x 144	.907	40.04	.020	40 V 144	.200	20.02

ALUMINUM COILED SHEET LISTED ON PAGE 29 THIS SECTION.





ALUMINUM FLAT SHEET

ALLOY 2024-0 ALCLAD

		We	ight			We	ight
		Lbs. per	Lbs. per			Lbs. per	Lbs. per
Thickness	Size	Sq Foot	Sheet	Thickness	Size	Sq Foot	Sheet
Inches	Inches	(Approx.)	(Approx.)	Inches	Inches	(Approx.)	(Approx.)
.160	48 x 144	2.30	110.40	.063	48 x 144	.907	43.54
.125	48 x 144	1.80	86.40	.050	48 x 144	.720	34.56
.100	48 x 144	1.44	69.12	.040	48 x 144	.576	27.65
.090	48 x 144	1.30	62.40	.032	48 x 144	.461	22.13
.080	48 x 144	1.15	55.20	.025	48 x 144	.360	17.28
.071	48 x 144	1.02	48.96	.020	48 x 144	.288	13.82
		А	LLOY 2024-	T3 MILL FINIS	Н		
.190	48 x 144	2.74	131.52	.050	48 x 144	.720	34.56
.160	48 x 144	2.30	110.40	.040	48 x 144	.576	27.65
.125	48 x 144	1.80	86.40	.032	48 x 144	.461	22.13
.100	48 x 144	1.44	69.12	.025	48 x 144	.360	17.28
.090	48 x 144	1.30	62.40	.020	36 x 144	.288	10.37
.080	48 x 144	1.15	55.20	.020	48 x 144	.288	13.82
.063	48 x 144	.907	43.54				
			ALLOY 2024	4-T3 ALCLAD			
.190	48 x 144	2.74	131.52	.040	36 x 144	.576	20.74
.125	48 x 144	1.80	86.40	.040	48 x 144	.576	27.65
.100	48 x 144	1.44	69.12	.032	48 x 144	.461	22.13
.090	48 x 144	1.30	62.40	.025	48 x 144	.360	17.28
.080	48 x 144	1.15	55.20	.020	36 x 144	.288	10.37
	48 x 144	1.02	48.96	.020	48 x 144	.288	13.82
.071		.907	43.54	.016	36 x 144	.230	8.28
.063	48 x 144 48 x 144	.720	34.56	.010	24 x 90	.144	2.16

		,	ALLOY 6061-	O MILL FINISI			
.125	48 x 144	1.76	84.48	.063	48 x 144	.889	42.67
.090	48 x 144	1.27	60.96	.050	48 x 144	.706	33.89
.080	48 x 144	1.13	54.24	.040	48 x 144	.564	27.07
.071	48 x 144	1.00	48.00	.032	48 x 144	.452	21.70
		4	LLOY 6061-1	r4 MILL FINIS	н		
100	48 x 144	2.68	128.64	.063	48 x 144	.889	42.67
.190		1.76	84.48	.050	48 x 144		33.89
.125	48 x 144			.040	48 x 144		27.07
.090	48 x 144	1.27	60.96	.032	48 x 144		21.70
.080 .071	48 x 144 48 x 144		54.24 48.00	.032	40 X 144	.402	21.10
.011	40 % 144						
				T6 MILL FINIS		1 00	40.00
.190	48 x 144		128.64	.071	48 x 144		48.00
.190	60 x 180	2.68	201.00	.063	36 x 96		21.34
.160	48 x 144	2.26	108.48	.063	48 x 120		35.56
.125	36 x 96	1.76	42.24	.063	48 x 144		42.67
.125	48 x 144	1.76	84.48	.063	60 x 144	.889	53.34
.125	48 x 192		112.64	.050	48 x 144		33.89
.125	60 x 144		105.60	.040	48 x 144		27.07
.090	48 x 144	1.27	60.96	.032	48 x 144		21.70
.090	60 x 144	1.27	76.20	.025	36 x 144		12.71
.080	48 x 144	1.13	54.24	.025	48 x 144	.353	16.94



ALUMINUM FLAT SHEET

ALLOY 7075-0 MILL FINISH

Weight

Weight

	Thickness Inches	Size Inches	Lbs. per Sq Foot (Approx.)	Lbs. per Sheet (Approx.)	Thickness Inches	Size Inches	Lbs. per Sq Foot (Approx.)	Lbs. per Sheet (Approx.)	
	.125	48 x 144	1.82	87.36	.050	48 x 144	.727	34.90	
	.090	48 x 144	1.31	62.88	.040	48 x 144	.582	27.94	
	.080	48 x 144	1.16	55.68	.032	48 x 144	.465	22.32	
	.071	48 x 144	1.03	49.44	.025	48 x 144	.364	17.47	
	.063	48 x 144	.916	43.97	.020	48 x 144	.291	13.97	
				ALLOY 707	75-0 ALCLAD				
	.190	48 x 144	2.76	132.48	.050	48 x 144	.727	34.90	
	.125	48 x 144	1.82	87.36	.040	48 x 144	.582	27.94	
U	.112	48 x 144	1.63	78.24	.032	48 x 144	.465	22.32	
k	.100	48 x 144	1.45	69.60	.025	48 x 144	.364	17.47	
U	.071	48 x 144	1.03	49.44	.020	36 x 144	.291	10.48	
	.063	48 x 144	.916	43.97		00 11 2 11	,201		
			Į.	ALLOY 7075-	T6 MILL FINIS	SH .			
ı	.160	48 x 144	2.33	111.84	.063	48 x 144	.916	43.97	
ı	.125	48 x 144	1.82	87.36	.050	48 x 144	.727	34.90	
ı	.100	48 x 144	1.45	69.60	.040	48 x 144	.582	27.94	
ı	.090	48 x 144	1.31	62.88	.032	48 x 144	.465	22.32	
ı	.080	48 x 144	1.16	55.68	.025	48 x 144	.364	17.47	
ı	.071	48 x 144	1.03	49.44	.020	48 x 144	.291	13.97	
			,						

ALLOY 7075-T6 ALCLAD

.160	48 x 144	2.33	111.84	.063	48 x 144	.916	43.97
.140	48 x 144	2.01	96.48	.050	48 x 144	.727	34.90
.125	36 x 144	1.82	65.52	.040	48 x 144	.582	27.94
.125	48 x 144	1.82	87.36	.032	48 x 144	.465	22.32
.112	48 x 144	1.63	78.24	.025	48 x 144	.364	17.47
.100	48 x 144	1.45	69.60	.020	48 x 144	.291	13.97
.090	48 x 144	1.31	62.88	.016	36 x 144	.233	8.39
.080	48 x 144	1.16	55.68	.016	48 x 144	.233	11.18
.071	48 x 144	1.03	49.44	.012	36 x 144	.175	6.30

ALUMINUM COILED SHEET LISTED ON PAGE 29, THIS SECTION.

Many other sizes can be furnished promptly from mill stocks.



ALUMINUM COILED SHEET

ALLOY 1100-0 MILL FINISH

		ALLO1 1100	O MILL THUSH		
Thickness	Width	Weight Lbs. per Sq Foot	Thickness	Width	Weight Lbs. per Sq Foot
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
.050	18	.706	.020	12 1/4	.282
	12 1/4	.564	.020	24	.282
.040			.016	12 1/4	.226
.032	$12\ 1/4$ $12\ 1/4$.452	.010	12 1/ 4	.220
.025	12 1/4	.303			
		ALLOY 1100-1	H14 MILL FINISH		
.050	22 7/8	.706	.024	36	.339
		.452	.019	22 7/8	.268
.032	36	.452	.019	36	.268
.032 .024	48 22 7/8	.339	.019	30	.200
		ALLOY 3003	-O MILL FINISH		
.081	3 3/4	1.150	.040	12 1/4	.570
.081	15 1/4	1.150	.018	2 3/8	.257
.040	12	.570	1		
		ALLOY 3003-	H14 MILL FINISH		
.080	6 1/2	1.140	.025	18	.356
		ALLOY 3105-H	125 MILL FINISH		
.050	48	.713	.032	48	.456
.040	48	.570	.024	48	.343
.040	40	.010	.021	10	.010
		ALLOY 5052	-O MILL FINISH		
.081	12 1/8	1,130	.032	12 1/2	.447
.050	12 1/8	.698	.025	12	.349
.035	4 1/8	.489	.020	4 1/4	.280
.035	4 1/2	.489	.018	13 5/8	.251
.035	15 3/4	.489	.010	10 0/ 0	
.033	10 0/ 1	. 100	•		
		ALLOY 5052-	H34 MILL FINISH		
.156	3 7/8	2.180	.032	11/16	.349
		ALLOY 6061	-T4 MILL FINISH		
.080	10 3/8	1.130	.063	5 7/8	.889

Many other sizes can be furnished promptly from mill stocks.

ALUMINUM 29.



ALUMINUM PLATE

ALLOY 3003-F MILL FINISH

			ight				ight
		Lbs. per		em1 1 1	a:	Lbs. per	Lbs. per
Thickness	Size	Sq Foot	Plate	Thickness	Size	Sq Foot	Plate
Inches	Inches	(Approx.)	(Approx.)	Inches	Inches	(Approx.)	(Approx.)
.500	36 x 96	7.13	171,12	.250	36 x 96	3.56	85.44
.375	36 x 96	5.35	128.40	.250	48 x 144	3.56	170.88
.010	00 A 00	0.00					
		AL	LOY 3003-H	14 MILL FINIS	БН		
.500	36 x 96	7.13	171.12	.250	36 x 96	3.56	85.44
.375	36 x 96	5.35	128.40	.250	48 x 144	3.56	170.88
		A	LLOY 5052-	F MILL FINISH	1		
0.50	00 00	0.40	0.9 7.6	.250	48 x 144	3,49	167.52
.250	36 x 96	3.49	83.76	.250	40 X 144	0.40	101.02
		ALI	OY 5052-H	32 MILL FINIS	SH		
.375	36 x 96	5.24	125.76	.250	36 x 96	3.49	83.76
.313	36 x 96	4.37	104.88	.250	48 x 144	3.49	167.52
			ov 2024	O STENCILLED			
		,	2024-	O STENCILLED	,		
.375	48 x 144	5.40	259.20	.250	48 x 144	3.60	172.80
			ALLOY 2024	I-T351 OILED			
1,500	36 x 96	21.60	518.40	.375	48 x 144	5.40	259.20
.500	36 x 96	7.20	172.80	.313	36 x 96	4.51	108.24
.500	48 x 144		345.60	.250	48 x 144	3.60	172.80
.375	36 x 96	5.40	129.60		20 10 222		
		ALLOY	2024-T351	ALCLAD-STEN	CILLED		
.375	36 x 96	5.40	129.60	.250	36 x 96	3.60	86.40
.375	48 x 144		259.20		48 x 144	3.60	172.80
.313	36 x 96	4.51	108.24		20 11 222		
		Al	LOV 2024-T	4 MILL FINISI	4		
		AL	2024-1	- MILE THAIST	•		
.375	36 x 96	5.40	129.60	.250	36 x 96	3.60	86.40
.375	48 x 144	5.40	259.20	.250	48 x 144	3.60	172.80
.313	36 x 96	4.51	108.24	1			
			ALLOY 6061-	T6 STENCILLE	D ·		
.500	30 x 30	7.06	44.13	.375	48 x 144	5.29	253.92
.500	36 x 96		169.44	.250	48 x 144	3.53	169.44
					6	1 -41	
	Many	other gauge	s can be furn	ished promptl	y irom mil	I Stocks.	



ALUMINUM PLATE

ALLOY 6061-T651 STENCILLED

		We	ight	1		We	ight
Thickness Inches	Size Inches	Lbs. per Sq Foot (Approx.)	Lbs. per Plate (Approx.)	Thickness Inches	Size Inches	Lbs. per Sq Foot (Approx.)	Lbs. per Plate (Approx.)
1.000	36 x 96	14.12	338.88	.375	48 x 144	5.29	253.92
.750	36 x 96	10.59	254.16	.313	48 x 144	4.42	212.16
.500	36 x 96	7.06	169.44	.250	36 x 96	3.53	84.72
.500	48 x 144	7.06	338.88	.250	48 x 144	3.53	169.44

ALLOY 7075-0 MILL FINISH

.500 36 x 96 7.27 174.48 l

ALLOY 7075-T651 MILL FINISH

.250 48 x 144 3.64 174.72 | ...

ALUMINUM #1 TOOL & JIG PLATE

1.000 48 x 96 14.53 465.00 l

ALUMINUM #2 TOOLING PLATE

.750 48 x 96 10.91 349.00 l .500 48 x 96 7.28 233.00

ALUMINUM TREAD PLATE

ALLOY 2024-T4

.375 .375	24 x 36 x	48 48	5.40 5.40	43.20 64.80	1	.375	48 x 144	5.40	259.20

ALLOY 6061-T6

.375	24 x 48	5.29	42.32	1	.188	48 x 192	2.65	169.60
.375	48 x 144	5.29	253.92		.125	48 x 192	1.76	112.64

We can also supply, on order, many Aluminum Sheet and Plate Specialties, such as the following. Your inquiries are invited:

Embossed Sheet
Circles & Rings
Fin Stock
License Plate Stock
Type 1 Mobile Home Flat Sheet & Coil
Type 2 Mobile Home Coiled Sheet—Painted
& Unpainted

Truck Trailer Panel Stock

Traffic and Street Sign Blanks Industrial Foil Architectural Sheet Brazing Sheet Porcelain Enameling Sheet Tread Plate Litho Sheet

Many other gauges can be furnished promptly from mill stocks.

CHASE ALUMINUM SHEET AND PLATE*

STANDARD TOLERANCES (1)

THICKNESS TOLERANCES

TABLE 1. Alloys 2014, Alclad 2014, 2024, Alclad 2024, 3004, Alclad 3004, 5052, 6061, Alclad 6061, 7075, Alclad 7075.

					S	ecified	Width-I	nches				
Specified	Up	Over	Over	Over	Over	Over	Over	Over	Over	Over	Over	Over
Thickness	thru	18	36	48	54	60	66	72	78	84	90	96
(Inches)	18	thru 36	thru 48	thru 54						thru 90	thru 96	thru 132
					Tolera	nce-Inc	hes Plus	and Mi	nus			
0.006-0.010	.001	.0015	.0025	_	-	_		_	-	-	_	-
0.011-0.017	.0015	.0015	.0025	.0035	_	-	-	-	-	_	_	_
0.018-0.028	.0015	.002	.0025	.0035	.004	-	_	_	_	_	_	_
0.029-0.036	.002	.002	.0025	.004	.005	.005	.005	.006	.006	_	_	-
0.037-0.045		.0025	.003	.004	.005	.005	.005	.006	.006	-	_	_
	.0025	.003	.004	.005	.006	.006	.006	.007	.007	_	_	_
0.069-0.076	.003	.003	.004	.005	.006	.006	.006	.007	.007	.012	_	_
0.077-0.096	.0035	.0035	.004	.005	.006	.006	.006	.007	.007	.012	_	-
0.097-0.108	.004	.004	.005	.005	.007	.007	.007	.008	.008	.016	.018	.020
0.109-0.125	.0045	.0045	.005	.005	.007	.007	.007	.008	.008	.016	.018	.020
0.126-0.140	.0045	.0045	.005	.005	.007	.010	.012	.013	.014	.016	.018	.020
0.141-0.172	.006	.006	.008	.008	.009	.012	.014	.015	.016	.017	.019	.023
0.173-0.203	.007	.007	.010	.010	.011	.014	.016	.017	.017	.017	.022	.026
0.204-0.249	.009	.009	.011	.011	.013	.016	.018	.018	.018	.018	.024	.028
0.250-0.320	.013	.013	.013	.013	.015	.018	.020	.020	.020	.020	.025	.030
0.321-0.438	.019	.019	.019	.019	.020	.020	.023	.023	.025	.025	.026	.033
0.439-0.625	.025	.025	.025	.025	.025	.025	.025	.030	.030	.030	.035	.035
0.626-0.875	.030	.030	.030	.030	.030	.030	.030	.037	.037	.037	.045	.045
0.876-1.125	.035	.035	.035	.035	.035	.035	.035	.045	.045	.045	.055	.055
1.126-1.375	.040	.040	.040	.040	.040	.040	.040	.052	.052	.052	.065	,065
1.376-1.625	.045	.045	.045	.045	.045	.045	.045	.060	.060	.060	.075	.075
1.616-1.875	.052	.052	.052	.052	.052	.052	.052	.070	.070	.070	.088	.088
1.876-2.250	.060	.060	.060	.060	.060	.060	.060	.080	.080	.080	.100	.100
2.251-2.750	.075	.075	.075	.075	.075	.075	.075	.100	.100	.100	.125	.125
2.751-3.000	.090	.090	.090	.090	.090	.090	.090	.120	.120	.120	.150	.150
3.001-4.000	.110	.110	.110	.110	.110	.110	.110	.140	.140	.140	.160	.160
4.001-5.000	.125	.125	.125	.125	.125	.125	.125	.150	.150	.150	_	_
5.001-6.000	.135	.135	.135	.135	.135	.135	.135	.160	.160	.160	_	_

TABLE 2. Alloys 1100, 3003, Alclad 3003, 5005, 5050.

			Sp	ecified Width	-Inches		
Specified Thickness (Inches)	Up thru 18	Over 18 thru 36	Over 36 thru 54	Over 54 thru 72	Over 72 thru 90	Over 90 thru 102	Over 102 thru 132
(Toleran	ce-Inches P	lus and Minu	s	
0.006-0.007	.001	.001	_	_	-	_	_
0.008-0.010	.001	.0015	_	_	_	_	_
0.011-0.017	.0015	.0015	.002	_	_	_	_
0.018-0.028	.0015	.002	.0025	-		_	_
0.029-0.036	.002	.002	.0025	.0035	.005	_	
0.037-0.045	.002	.0025	.003	.004	.005	_	_
0.046-0.068	.0025	.003	.004	.005	.006	_	_
0.069-0.076	.0025	.003	.004	.006	.008	_	_
0.077-0.096	.003	.003	.004	.006	.008	_	_
0.097-0.108	.0035	.004	.005	.007	.009	.010	
0.109-0.140	.0045	.0045	.005	.007	.009	.010	_
0.141-0.172	.006	.006	.008	.009	.011	.012	_
0.173-0.203	.007	.007	.009	.011	.013	.015	_
0.204-0.249	.009	.009	.011	.013	.015	.017	_
0,250-0,320	.013	.013	.013	.015	.017	.020	
0.321-0.438	.019	.019	.019	.019	.023	.026	.026
0.439-0.625	.025	.025	.025	.025	.030	.035	.035
0.626-0.875	.030	.030	.030	.030	.037-	.045	.045
0.876-1.125	.035	.035	.035	.035	.045	.055	.055
1.126-1.375	.040	.040	.040	.040	,052	.065	.065
1.376-1.625	.045	.045	.045	.045	.060	.075	.075
1.626-1.875	.052	.052	.052	.052	.070	.088	.088
1.876-2.250	.060	.060	.060	.060	.080	.100	.100
2.251-2.750	.075	.075	.075	.075	.100	.125	.125
2.751-3.000	.090	.090	.090	.090	,120	.150	.150
3.001-4.000	.110	.110	.110	.110	.140	.160	.160
4.001-5.000	.125	.125	.125	.125	.150	_	_
5.001-6.000	.135	.135	.135	.135	.160	_	

① When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

DATA

CHASE METALS SERVICE



CHASE ALUMINUM SHEET AND PLATE

STANDARD TOLERANCES **

WIDTH TOLERANCES

TABLE 3. SHEARED FLAT SHEET AND PLATE

Specified		Specified Width-Inches										
Thickness Inches	Up thru 4	Over 4 thru 18	Over 18 thru 36	Over 36 thru 54	Over 54 thru 72	Over 72 thru 132						
0.006-0.064 0.065-0.102 0.103-0.249 0.250-0.500 0.501-1.000 1.001-1.250	± 1/32 ± 1/16 ± 1/8 — —	± 1/16 ± 1/16 ± 3/32 + 3/8 + 1/2 + 5/8	± 3/32 ± 3/32 ± 1/8 + 3/8 + 1/2 + 5/8	± 1/8 ± 1/8 ± 3/16 + 3/8 + 1/2 + 5/8	± 5/32 ± 5/32 ± 3/16 + 3/8 + 1/2 + 5/8	± 3/16 ± 3/16 ± 1/4 + 3/8 + 1/2 + 5/8						

TABLE 4. SLIT COILED SHEET

		Spec	ified Width-I	nches	
Specified Thickness (Inches)	Up thru 6	Over 6 thru 12	Over 12 thru 24	Over 24 thru 48	Over 48 thru 60
(Ziones)		Tolerance	-Inches Plus	and Minus	
0.006-0.125	0.010	0.016	1/32	3/64	1/16

TABLE 5. SAWED FLAT PLATE

		Specified Wid	th-Inches	
Specified Thickness (Inches)	Up thru 10	Over 10 thru 48	Over 48 thru 84	Over 84
(Inches)	7	Colerance-Inches	Plus and Minus	
0.250-6.000	3/32	3/16	1/4	5/16

TABLE 6. LENGTH TOLERANCES-SHEARED FLAT SHEET AND PLATE

	Specified Length-Inches						
Specified Thickness (Inches)	Up thru 18	Over 18 thru 48	Over 48 thru 120	Over 120 thru 144	Over 144 thru 180	Over 180 thru 240	Over 240 thru 540
(Inches)		Tolerance-Inches					
0.006-0.249 0.250-0.500 0.501-1.000 1.001-1.250	± 1/16 + 3/8 + 1/2 + 5/8	± 3/32 + 3/8 + 1/2 + 5/8	± 1/8 + 3/8 + 1/2 + 5/8	± 5/32 + 3/8 + 1/2 + 5/8	± 5/32 + 7/16 + 9/16 + 3/4	± 1/4 + 7/16 + 9/16 + 3/4	± 1/4 + 1/2 + 5/8 + 1

① When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM SHEET AND PLATE

STANDARD TOLERANCES **

TABLE 7 LENGTH TOLERANCES-SAWED FLAT PLATE

		Specified L	ength-Inches	
Specified Thickness (Inches)	Up thru 10	Over 10 thru 48	Over 48 thru 84	Over 84
(inches)	Т	olerance—Incl	nes Plus and I	Minus
0.250-6.000	3/32	3/16	1/4	5/16

LATERAL BOW TOLERANCES TABLE 8. FLAT SHEET AND PLATE

		Al	lowable	Deviat	ion of a	Side Ed	ge from	a Straig	ht Line
Specified Specified Thickness (Inches)						↑ Maximum	n allowa	ble value	e of AA
		Specified Length-Inches							
		Up thru 30	Over 30 thru 60	Over 60 thru 90	Over 90 thru 120	Over 120 thru 150	Over 150 thru 180	Over 180 thru 210	Over 320 thru 240
					Tolera	nce-Inc	hes		
Under 4 4-34.99 35-90	0.006-0.125 0.006-0.249 0.006-0.249	1/16 1/32 1/32	1/4 1/16 1/16	1/2 3/32 3/32	1 1/8 1/8	1 1/2 3/16 3/16	2 1 5/16	3 1 1/2 7/16	4 2 9/16
Under 10.01 10.01-18 Over 18	0.250-6.000 0.250-6.000 0.250-6.000	1/16 1/32 1/32	1/4 1/16 1/16	1/2 1/8 3/32	1 1/4 1/8	1 1/2 13/32 3/16	2 19/32 5/16	3 25/32 7/16	4 ② 1 ② 9/16 ②

TABLE 9. COILED SHEET

Specified Thickness	Length-Inches				
	Up thru 30	Over 30 thru 60	Over 60 thru 90	Over 90 thru 120	
(Inches) Allowable Deviation of a from a Straight 1				Edge	
	Tolerance—Inches				
0.006-0.125	1/16	1/4	1/2	1	

① When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.

⁽²⁾ Also applicable to any 240-inch increment of longer plate.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.





CHASE ALUMINUM SHEET AND PLATE

STANDARD TOLERANCES **

TABLE 10. SQUARENESS TOLERANCES-FLAT SHEET AND PLATE

			Speci	fied Length	-Inches		
	Up thru	Over 18	Over 48	Over 120	Over 144	Over 180	Over 240
	18	thru 48	thru 120	thru 144	thru 180	thru 240	thru 540
Specified Thickness (Inches)		Allowab		Maximu	h of Diagona	B e between A	r
0.006-0.249	1/8	3/16	1/4	5/16	5/16	1/2	1/2
0.250-0.500	3/8	3/8	3/8	3/8	7/16	9/16	5/8
0.501-1.000	1/2	1/2	1/2	1/2	9/16	5/8	3/4
1.001-6.000	5/8	5/8	5/8	5/8	3/4	3/4	1

FLATNESS TOLERANCES

SAWED OR SHEARED PLATE, H, T4, AND T6 TEMPERS

TABLE 11. LONGITUDINAL FLATNESS

Specified Thickness (Inches)	Tolerance ③ —Inches Allowable Deviation from Flat
0.250-3.000	1/4 in any 6 feet or less

TABLE 12. TRANSVERSE FLATNESS

Specified	Tolerance ③ —Inches Allowable Deviation from Flat				
Thickness (Inches)	Widths Over 4 ft. thru 6 ft. 3	Widths Over 2 ft. thru 4 ft.	Widths 2 ft. and less		
0.250-0.624 0.625-1.500 1.501-3.000	1/2 3/8 1/4	3/8 1/4 3/16	Only short- cycle flatness tolerance applies		

① When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.

As measured with plate resting on a flat surface concave side upward, using a straight edge and a feeler gauge, dial gauge or scale.

3 For widths over 6 feet, these tolerances apply for any 6 feet of total width.

*Source - Kaiser Aluminum & Chemical Sales, Inc.

CHASE ALUMINUM SHEET AND PLATE

STANDARD TOLERANCES ** FLATNESS TOLERANCES

SAWED OR SHEARED PLATE, T351, T451, T651 AND T851 TEMPERS

TABLE 13. LONGITUDINAL FLATNESS

Specified Thickness (Inches)	Tolerance — Inches Allowable Deviation from Flat
0.250-3.000 3.001-6.000	3/16 in any 6 feet € 1/8 in any 6 feet or less

TABLE 14. TRANSVERSE FLATNESS

Specified	Tolerance —Inches Allowable Deviation from Flat				
Thickness (Inches)	Widths Over 4 ft. thru 6 ft. 3	Widths Over 2 ft. thru 4 ft.	Widths 2 ft. and less		
0.250-0.624 0.625-1.500 1.501-3.000 3.001-6.000	3/8 5/16 3/16 1/8	5/16 3/16 3/16 1/8	Only short- cycle flatness tolerance applies		

① When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.

As measured with plate resting on a flat surface concave side upward, using a straight edge and a feeler gauge, dial gauge or scale.

3 For widths over 6 feet, these tolerances apply for any 6 feet of total width.

For lengths under 6 feet, the tolerance is 1/8 inch.

*Source - Kaiser Aluminum & Chemical Sales, Inc.

CHASE ALUMINUM SPECIFICATIONS*

Subject	Spec. No.	Agency
TESTING		
Metals, Test Methods	FED-STD-151A-1	Federal
Inspection, Ultrasonic	AMS 2630	SAE
TOLERANCES		
Gauge, Width, Length, etc.	FED-STD-245A	Federal
Gauge, Width, Length, etc.	AMS 2202D	SAE
	11110 22022	0112
MARKING	TED COND 104	3.61114
Identification Marking of Aluminum	FED-STD-184	Military
PACKING		
Preparation for Storage and Shipment	MIL-A-20695-1	Military
ALLOY-TEMPER		
1060-O, H12, H14, H112	B209-60T	ASTM
1060-O, H12, H14, H112	Section VIII ①	ASME
1070-O	AMS 4000B	SAE
1100-O, H12, H14, H16, H18, H22, H24, H26, H28, F	QQ-A-561c	Federal
1100-H16, H26	MIL-P-3125-3	Military
1100-O, H12, H14, H16, H18, H112	B209-60T	ASTM
1100-O	AMS 4001B	SAE
1100 - H112 H14 H112	AMS 4003B	SAE
1100-O, H112, H14, H112	Section VIII ①	ASME
1360-O, F	MIL-A-799	Military
2014-O	AMS 4028	SAE
2014-T6	AMS 4029	SAE
Alclad 2014-O, T3, T4, T42, T6, F	QQ-A-255a-1	Federal
Alclad 2014-O, T3, T4, T6	B209-60T	ASTM
X2020-O, T6, T651, F	MIL-A-8882	Mil. (ASG
2024-O, T3, T36, T4, T42, T6, T81, T86, F, T351, T851	QQ-A-355c-1	Federal
2024-O, T3, T4	B209-60T	ASTM
2024-T351	AMS 4033	SAE
2024-O	AMS 4035D	SAE
2024-T3, Sheet, T4 Plate	AMS 4037E	SAE
Alclad 2024-O, T3, T36, T4, T42, T6, T81, T86,		
F, -T351, T851	QQ-A-362b-1	Federal
Alclad 2024-T3, T36, T4, T81, T86 (shim stock)	MIL-S-22499	Mil. (Wep
Alclad 2024-O, T3, T4	B209-60T	ASTM
Alclad 2024-T351	AMS 4034	SAE
Alclad 2024-T3 Sheet, T4 Plate (alclad one side)	AMS 4036	SAE
Alclad 2024-O	AMS 4040E	SAE
Alclad 2024-T3 Sheet, T4 Plate	AMS 4041 F	SAE
Alclad 2024-T36	AMS 4042E	SAE
3003-O, H12, H14, H16, H18, H22, H24, H26,		
H28, -H112, F	QQ-A-359d	Federal
3003 (perforated sheet conforming to QQ-A-359)	MIL-S-12875A-1	Military
3003-O, H12, H14, H16, H18, H112	B209-60T	ASTM
3003-O	AMS 4006B	SAE
3003-H14	AMS 4008B	SAE
3003-O, H12, H14, H112	Section VIII ①	ASME
Alclad 3003-O, H12, H14, H112 Alclad 3003-O, H12, H14, H112	B209-60T	ASTM ASME
	Section VIII ①	
3004-O, H32, H34, H36, H38, H112	B209-60T	ASTM
3004-O, H32, H34, H112	Section VIII ①	ASME

ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels.
 Continued

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM SPECIFICATIONS*

Subject	Spec. No.	Agency
ALLOY-TEMPER		
A1-1-4 2004 O 1122 U24 U112	B209-60T	ASTM
Alclad 3004-O, H32, H34, H112	Section VIII ①	ASME
Alclad 3004-O, H32, H34, H112	Section vili (i)	ADME
5005-O, H12, H14, H16, H18, H32, H34, H36, H38	B209-60T	ASTM
5050-O, H32, H34, H36, H38, H112	B209-60T	ASTM
5050-O, H32, H34, H112	Section VIII ①	ASME
5050 C 1700 1704 1100 1100 1100 1100 1100		
5052-O, H22, H24, H26, H28, H32, H36, H38,	QQ-A-318c	Federal
Plate: H112, F	MIL-S-10104B	Military
5052 (clear or pigmented coating)		Military
5052 (perforated sheet conforming to QQ-A-318)	MIL-S-12875A-1	ASTM
5052-O, H32, H34, H36, H38, H112	B209-60T	
5052-O	AMS 4015D	SAE
5052-H32	AMS 4016D	SAE
50 5 2 - H34	AMS 4017D	SAE
5052-O, H32, H34, H112	Section VIII ①	ASME
5052-O, H32, H34, H112	NPFA 385 ②	NFPA
5083-O, H32, H34, H113	MIL-A-17358C	Military
5083-O, H32, H34, H113	B209-60T	ASTM
5083-O	AMS 4056	SAE
5083-H32	AMS 4057A	SAE
5083-H34	AMS 4058-A	SAE
5083-H113	AMS 4059	SAE
5083-O, H113	Section VIII ①	ASME
5000 O 1100 1104 1100 11119	MIL-A-19070A	Military
5086-O, H32, H34, H36, H112	B209-60T	ASTM
5086-O, H32, H34, H36, H112	Section VIII ①	ASME
5086-O, H32, H34, H112	NFPA 385 ②	NFPA
5086-O, H32, H34, H112	NFFA 303 ©	MIIA
5154-O, H32, H34, H36, H38, H112	B209-60T	ASTM
5154-O	AMS 4018	SAE
5154-H32	AMS 4019	SAE
5154-O, H32, H34, H112	Section VIII ①	ASME
5154-O, H32, H34, H112	NFPA 385 ②	NFPA
5254-0, H32, H34, H36, H38, H112	B209-60T	ASTM
5454-O, H32, H34, H36, H38, H112	MIL-A-21598	Mil. (ships)
5454-O, H32, H34, H112	B209-60T	ASTM
5454-O, H32, H34, H112	NFPA 385 ②	NFPA
5456-O, H24, H343 (sheet only); H321 (plate only)	MIL-A-19842B-1	Mil. (ships
	B209-60T	ASTM
5456-O, H24, H321	Section VIII ①	ASME
5456-O, H321	Section vill (1)	ADME

[@] ASME Boiler and Pressure Vessel Code, SectionVIII, Unfired Pressure Vessels.

NFPA-385—Tank Vehicles for Flammable Liquids. (National Fire Protection Association).

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM SPECIFICATIONS*

Subject	Spec. No.	Agency
ALLOY-TEMPER		
5652-O, H32, H34, H36, H38, H112	B209-60T	ASTM
6061-O, T4, T6	QQ-A-327b	Federal
6061-O, T4, T6, F (floor plate)	MIL-F-17132B	Military
	B209-60T	ASTM
6061-O, T4, T6	AMS 4025C	SAE
6061-O		SAE
6061-T4	AMS 4026C	SAE
6061-T6	AMS 4027C	
6061-T4, T6	Section VIII ①	ASME
Alclad 6061-O, T4, T6	B209-60T	ASTM
Alclad 6061-O	AMS 4021B	SAE
Alclad 6061-T4	AMS 4022B	SAE
Alclad 6061-T6	AMS 4023B	SAE
Alclad 6061-T4, T6	Section VIII ①	ASME
niciau 0001-14, 10	Section vin (
7075-O, T6, F	QQ-A-283a	Federal
7075-O, T6	B209-60T	ASTM
7075-T651	AMS 4038	SAE
7075-O	AMS 4044B	SAE
7075-T6	AMS 4045B	SAE
1015-10	TIME TOTOE	
Alclad 7075-O, T6, T651, F	QQ-A-287a-1	Federal
Alclad 7075-O, T6	B209-60T	ASTM
Alclad 7075-T651 (plate)	AMS 4039	SAE
Alclad 7075-T6 (alclad one side)	AMS 4046	SAE
Alclad 7075-T6 (roll tapered sheet)	AMS 4047B	SAE
Alclad 7075-O	AMS 4048C	SAE
	AMS 4049C	SAE
Alclad 7075-T6	AMD 1013C	5112
7079-T6, T651, F	MIL-A-8877-1	Mil. (ASG)
7079-T651	AMS 4024	SAE
7178-O, T6, F	MIL-A-9180A	Mil. (USAF
Alclad 7178-O, T6, F	MIL-A-9183B	Mil. (ASG)
Alclad 7178-O	AMS 4051A	SAE
Alclad 7178-T6	AMS 4052A	SAE
Arciau 1176-16	AMD 100211	
8112 (duct sheet)	MIL-A-52174	Mil. (ORD)
X8280 (6.5% tin alloy)-H12	MIL-A-11267A	Mil. (ORD)
Brazing Alloys-716, 4043, 4047 (718), 4343	QQ-B-655b	Federal
Brazing Sheet-Class 1, 2, 3, 4, 5, 6, 7, 8 (No. 11, 12, 21, 22 Brazing Alloy)	MIL-A-20148A	Military
Brazing Sheet—No. 21	AMS 4054	SAE
Brazing Sheet—No. 22	AMS 4055	SAE
Anmon Dista (deflector)	MIL-A-7168A-1	Military
Armor Plate (deflector)		•
Armor Plate (protector)	MIL-A-7169A-1	Military
Armor Plate (weldable)	MIL-A-46027B	Mil. (ORD)

① ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM SHEET*

NOMINAL WEIGHTS-POUNDS PER LINEAL FOOT ALLOYS-1100, 3004, 5005, 6061

Thick- ness							W	idth in l	nches							
Inch	1/16	1/8	1/4	3/8	1/2	3/4	1	2	3	4	5	6	7	8	9	10
0.1285	0,0094	0.0189										0.9067				1.511
0.1144	0.0084	0.0168										0.8069				1.345
0.1019	0.0075	0.0150										0.7187				1.198
0.0907	0.0067	0.0133	0.0267	0.0400	0.0533	0.0800	0.1066	0.2132	0.3199	0.4265	0.5331	0.6397	0.7464	0.8530	0.9596	1.066
8080,0	0.0059	0.0119	0.0237	0.0356	0.0475	0.0712	0.0950	0.1900	0.2849	0.3799	0.4749	0.5699	0.6649	0.7598	0.8548	0.949
0.0720	0.0053	0.0106	0.0212	0.0318	0.0423	0.0635	0.0846	0.1693	0.2539	0.3385	0.4232	0.5078	0.5924	0.6771	0.7617	0.846
0.0641	0.0047											0.4521				
0.0571	0.0042	0.0084	0.0168	0.0252	0.0336	0.0503	0.0671	0.1342	0.2014	0.2685	0.3356	0.4027	0.4699	0.5370	0.6041	0.671
0.0508	0.0037	0.0075										0.3583				
0.0453	0.0033	0.0067										0.3195				
0,0403	0.0030	0.0059										0.2842				
0.0359	0.0026	0,0053	0.0106	0.0158	0.0211	0.0317	0.0422	0.0844	0.1266	0.1688	0.2110	0.2532	0.2954	0.3376	0.3798	0.422
0.0320	0,0024	0.0047										0.2257				
0.0285	0.0021	0.0042										0.2010				
0.0254	0.0019											0.1791				
0.0226	0.0017	0.0033	0,0066	0.0100	0.0133	0.0199	0.0266	0.0531	0.0797	0.1063	0.1328	0.1594	0.1860	0.2125	0.2391	0.265
0,0201	0.0015	0.0030										0.1418				
0.0179	0.0013	0.0026										0.1262				
0.0159	0.0012											0.1121				
0.0142	0.0010	0.0021	0.0042	0,0063	0,0083	0.0125	0.0167	0.0334	0.0501	0.0668	0.0835	0.1001	0.1168	0.1335	0.1502	0.166
0.0126	0.00093	0.0019										0.0889				
0.0113	0.00083	0.0017										0.0797				
	0.00073											0.0705				
0.0089	0.00065	0.0013	0,0026	0.0039	0.0052	0.0078	0.0105	0.0209	0.0314	0.0418	0.0523	0.0628	0.0732	0.0837	0.0942	0.104
	0.00059															
	0.00052															
0.0063	0.00046	0.00093	0.0019	0.0028	0.0037	0.0056	0.0074	0.0148	0.0222	0.0296	0.0370	0.0444	0.0518	0.0592	0.0666	0.074

Other Alloys-Multiply 1100 alloy weight by following factors:

Alloy	Factor
3003 & 7079	1.01
2024	1.02
5050, 5052, 5454 & 5652	0.99
3004, 5005, 5357, 5457 & 6061	1,00
2014 & 7075	1.03
5083, 5086, 5254 & 5456	0.98
7178	1.04

COIL INFORMATION-OUTSIDE DIAMETERS

This table may be used to find the outside diameter of a coil or the weight per inch of coil width. The outside diameter may be determined if a coil is wound on a known arbor size (inside diameter) to a specified weight per inch of coil width. The weight per inch of coil width may be determined if arbor size and outside diameter are known.

Arbor Size, Inches	2	4	6	8	10	12	16	20
Pounds per Inch of Coil Width			Outs	side Diameter	of Coil, Inch	es		
10	11.4	12.0	12.7	13.8	15.1	16.5	19.6	23.0
20	16.1	16.5	17.1	17.9	18.9	20.0	22.6	25.6
30	19.7	19.9	20.4	21,1	22.0	22.9	25.3	28.0
40	22.7	22.9	23,3	23.9	24.7	25.6	27.7	30.1
50	25.3	25.6	25.9	26.5	27.1	27.9	29.9	32.2
60	27.8	28.0	28.3	28.8	29.4	30.1	31.9	34.1
70	29.9	30,1	30.4	30.9	31.5	32.2	33.9	35.9
80	32.0	32.2	32.5	32.9	33.4	34.1	35.7	37.7
90	33.9	34.1	34.4	34.8	35.3	35.9	37.4	39.3
100	35.8	35.9	36.2	36.6	37.0	37.6	39.1	40.9
110	37.5	37.6	37.9	38.3	38.7	39.3	40.7	42.4
120	39,1	39.3	39.5	39.9	40.3	40,9	42.2	43.9
130	40.7	40.9	41.1	41.5	41.9	42.4	43.7	45.3
140	42.3	42,4	42.6	43,0	43.4	43.9	45.2	46.7
145	43.0	43.2	43.4	43.7	44.1	44.6	46.0	47.4
150	43.7	43.9	44.1	44.4	44.8	45.3	46.7	48.3

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



ALUMINUM TEMPER DESIGNATIONS*

-F AS-FABRICATED—This designation applies to products which are supplied in the condition resulting from normal manufacturing operations without imposing special practices to control the amount of strain hardening or thermal treatment. For wrought products, there is no guarantee of mechanical properties.

-O ANNEALED, RECRYSTALLIZED—This designation applies to the softest temper of wrought alloy products.

-H STRAIN HARDENED—This designation applies to those products which are not subjected to thermal treatments to increase their mechanical properties, but which have their strength increased by strain hardening with or without supplementary thermal treatment to produce partial softening.

The -H is always followed by two or more digits. The first digit indicates the specific combination of basic operations and the following digit or digits the final degree of strain hardening, as explained below.

SUBDIVISIONS OF THE -H TEMPER

-H STRAIN HARDENED ONLY-As indicated above, the second digit designates the amount of cold work performed. The digit 8 has been selected to represent the hardest commercially practical temper, written thus: H-18. Since -H18 is considered full hard, and -O is annealed, material with tensile strength halfway between soft and full hard, or half hard, is designated -H14, quarter hard -H12, and so on. A third digit is often used to identify a special set of properties, for example, -H141 may represent material in some alloy with the same minimum properties as -H14, but with maximum values that are closer than standard. Or, it may represent material in some alloy with minimum values slightly different from those of -H14, but not sufficiently different to place it in the -H13 or -H15 classification. Extra hard tempers are designated by use of the second digit 9, with or without a third digit.

-H2 STRAIN HARDENED AND PARTIAL ANNEALED—It is often desirable to obtain a certain strength range in the strain hardened alloys by working to a harder temper and then reducing the strength to the desired level by partial annealing. This process is identified by the figure 2 in the first digit place, and the residual amount of cold work is then designated by the same method employed for the H-1 series. Thus, -H28 is full hard, -H24 half hard and so on. For alloys that age-soften at room temperature, the -H2 tempers have approximately the same tensile strength as the corresponding -H3 tempers. For other alloys, the -H2 tempers have approximately the same tensile strength as the corresponding -H1 tempers and slightly higher elongations.

-H3 STRAIN HARDENED AND THEN STABILIZED—The properties of magnesium-containing alloys in the strain hardened condition are stabilized by a low temperature heating, thus lowering slightly their strength and increasing ductility. If the treatment is not employed, then the change of properties occurs over a long time at room temperature. Use of this treatment is indicated by the digit 3 in the first digit place, and the degree of strain hardening is indicated in the usual way by one or two following digits.

-T TREATED TO PRODUCE STABLE TEMPERS OTHER THAN -F, -0' or -H-This designation applies to products thermally treated to produce stable tempers with or without supplementary strain hardening. The -T followed by the numerals designates one specific combination of basic operations, thus 6061-T6. Should some other variation of the same basic operations be applied to the same alloy, resulting in different characteristics, then other digits are added to



ALUMINUM TEMPER DESIGNATIONS*

Continued

the basic designation (6061-T61 or 6061-T62). It should be understood that a period of natural aging at room temperature may occur between or after the operations listed. Control of this period is exercised when it is metallurgically important, but is not indicated by the designation.

SUBDIVISIONS OF THE -T TEMPER

-T3 SOLUTION HEAT TREATED AND COLD WORKED, NATURALLY AGED TO SUBSTANTIALLY STABLE CONDITION — This designation applies to those products where cold work is performed for the primary purpose of improving the strength, thus, 2024-T36, and also applies to those products in which the effect of cold work, such as flattening or straightening, is recognized in applicable specifications (2024 flat sheet heat treated by the supplier is designated 2024-T3). No control is exercised to cold work at any particular stage during the natural aging cycle.

-T4 SOLUTION HEAT TREATED AND NATURALLY AGED TO SUBSTANTIALLY STABLE CONDITION—This designation applies when the product is not cold worked after heat treatment (2024 sheet heat treated by the user becomes 2024-T4), and also when applicable specifications do not recognize the effect of cold work resulting from flattening and straightening operations. (6061 flat sheet heat treated by the supplier is designated 6061-T4.) The alloy 7075 does not have a commercial -T4 designation.

-T6 SOLUTION HEAT TREATED AND THEN ARTIFICIALLY AGED—This designation applies to products which are not cold worked after solution heat treatment, or in which the effect if any, of flattening or straightening is not recognized in applicable specifications. (Whether flattened or not, 6061 heat treated and aged is designated 6061-T6, and 7075 treated in the same manner is 7075-T6).

-T8 SOLUTION HEAT TREATED, COLD WORKED AND THEN ARTIFICIALLY AGED-This designation applies when the cold working is done for the purpose of improving strength (Alclad 2024-T86), and also when the cold working effect of flattening or straightening is recognized in applicable specifications (Alclad 2024-T81 flat sheet).

STRESS-RELIEVED STRETCHED PLATE DESIGNATIONS

The increasing application of stress-relieved treatments to aluminum alloys has led to the assignment of a new series of temper designations to aluminum mill products that have received such treatments. The new temper series, which applies only to the heat-treatable aluminum alloys, is composed of three digits following the letter -T, such as -T351, -T851, and -T651. The digit in the first position indicates the basic temper. The second digit 5, arbitrarily assigned, is the "key" digit denoting that the material has received a stress-relieved treatment. The digit in the third or last place indicates the method of stress relieving. For wrought plate the digit 1 in the third position indicates that stress relieving has been accomplished by stretching. The tempers as they apply to various plate alloys are as follows:

Continued

*Source - Kaiser Aluminum & Chemical Sales, Inc.





ALUMINUM TEMPER DESIGNATIONS*

Alloy	Stress— Relieved Stretched Temper Designation
Bare and Alclad	
2014-T4 -T6	-T451 -T651
Bare and Alclad	
2024-T4 -T81	-T351 -T851
Bare 6061-T4 -T6	-T451 -T651
Bare and Alclad 7075-T6	-T651
Bare 7079-T6	-T651
Bare and Alclad 7178-T6	-T651

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM

CHEMICAL COMPOSITION LIMITS-SHEET AND PLATE ALLOYS $^{\oplus}{}^*$

A 11 a -	Cilian	Twom	Conna	Man-	Mag-	Chro-	Minlest	Zinc	Titanium	Oth	ers	Aluminum
Alloy	Silicon	Iron	Copper	ganese	nesium	mium	Nickel	Line	1 itanium	Each	Total	Min. @
EC ②	_	_	_		_	_		_	_	_	_	99.45
1050	0.25	0.40	0.05	0.05	0.05		-	0.05	0.03	0.03	_	99.50
1060	0.25	0.35	0.05	0.03	0.03	-		0.05	0.03	0.03	0.15	99.60
1100		+ Fe	0.20	0.05	_		_	0.10		0.05	0.15	99.00
1130 ③		+ Fe	0.20	_	_	-	_		_	0.05	0.15	99.30
1145	0.55 Si	+ Fe	0.05	0.05	_	_	_	_		0.03	_	99,45
1175@	0.15 Si		0.10	_	-	_		_	_	0.02	-	99.75
1199	0.006	0.006	0.006		0.006	_	_	0.006		0.002		99,99
1230®	0.7 Si		0.10	0.05	_		-	0.10	-	0.05	0.15	99.30
2014	0.50-1.2	1.0	3.9-5.0	0.40-1.2	0.20-0.8	0.10	-	0.25	0.15	0.05	0.15	Remainder
2024	0.50	0.50	3.8-4.9	0.30-0.9	1.2-1.8	0.10		0,25	_	0.05	0.15	Remainder
2618	0.25	0.9-1.3	1.9-2.7	_	1.3-1.8		0.9-1.2		0.04-0.10		0.15	Remainder
3003	0.6	0.7	0.20	1.0-1.5	_		_	0.10	_	0.05		Remainder
3004	0.30	0.7	0.25	1.0-1.5	0.8-1.3	_	_	0.25	_	0.05		Remainder
4343®	6.8-8.2	0.8	0.25	0.10	-		-	0.20	_	0.05		Remainder
5005	0.40	0.7	0.20	0.20	0.50-1.1	0.10	_	0.25	_	0.05	0.15	Remainder
5050	0.40	0.7	0.20	0.10	1.0-1.8	0.10	-	0.25	_	0.05		Remainder
5052	0.45 Si		0.10	0.10		0.15-0.35	_	0.10	_	0.05	0.15	Remainder
5056	0.30	0.40	0.10	0.05-0.20		0.05-0.20		0.10		0.05		Remainder
5083	0.40	0.40	0.10	0.30-1.0		0.05-0.25	-	0.25	0.15	0.05		Remainder
5086	0.40	0.50	0.10	0.20-0.7	3.5-4.5	0.05-0.25		0.25	_	0.05	0.15	Remainder
5155	0.30	0.7	0.25	0.20-0.6	3.5-5.0	0.05-0.25	_	0.25	0.15	0.05		Remainder
5254	0.45 Si		0.05	0.01		0.15-0.35	-	0.20	0.05	0.05		Remainder
5357	0.12	0.17	0.07	0.15-0.45	0.8-1.2	_		-		0.05	0.15	Remainder
5454	0.40 Si		0.10	0.50-1.0		0.05-0.20	-	0.25	0.20	0.05		Remainder
5456	0.40 Si	+ Fe	0.20	0.50-1.0	4.7-5.5	0.05-0.20	_	0.25	0.20	0.05®	0.15	Remainder
5457	0.08	0.10	0.20	0.15-0.45	0.8-1.2	-	_	_		0.03		Remainder
5557	0.10	0.12	0.15	0.10-0.40		_			_	0.03		Remainder
5652	0.40 Si		0.04	0.01		0.15-0.35		0.10	_	0.05		Remainder
	0.35-1.0	0.6	0.10	0.8	0.8-1.5	0.35		0.20	0.10	0.05		Remainder
6061	0.40-0.8	0.7	0.15-0.40	0.15	0.8-1.2	0.15-0.35	_	0.25	0.15	0.05	0.15	Remainder
6066	0.9-1.8	0.50	0.7-1.2	0.6-1.1	0.8-1.4	0.40		-	0.20	0.05		Remainder
6951	0.20-0.50	0.8	0.15-0.40	0.10	0.40-0.8	_		0.20	_	0.05		Remainder
70727	0.20-0.50 0.7 Si		0.10	0.10	0.10	_	_	0.8-1.3	_	0.05		Remainder
7075	0.50	0.7	1.2-2.0	0.30		0.18-0.40	-	5.1-6.1	0.20	0.05		Remainder
7079	0.30	0.40	0.40-0.8	0.10-0.30	2,9-3.7	0.10-0.25	_	3.8-4.8	0.10	0.05	0.15	Remainder
7178	0.50	0.7	1.6-2.4	0.30	2.4-3.1		_	6.3-7.3	0.20	0.05		Remainder

- ① Composition in percent maximum unless shown as a range.
- 2 Electrical conductor metal.
- 3 Reflector Sheet.
- ① Cladding on Clad 1100 and 3003 Reflector Sheet.
- ® Cladding on Alclad 2024.
- (6) Cladding on Alclad 2014.
- Tladding on Alclad 3003, Alclad 3004, Alclad 5050, Alclad 6061, Alclad 7075, and Alclad 7178.
- ® Cladding on Brazing Sheet.
- Beryllium 0.0005 maximum.
- @ Aluminum percentage determined by difference.
- *Source Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM

TYPICAL ALLOY-TEMPER CHARACTERISTICS **

		Cold)			w	elda	bility			Cold)			w	elda	bility
Alloy and Temper	Resistance to Corrosion	Workability (Cold)	Machinability	Brazeability	Gas	Arc	Resistance Spot & Seam	Alloy and Temper	Resistance to Corrosion	Workability (Cold)	Machinability	Brazeability	Gas	Arc	Resistance Spot & Seam
EC-0	A	A	D	A	A	A	В	5005-H16	Α	С	C	В	A	A	A
-H12	A	A	D	A	A	A	A	-H18	A	C	C	В	A	A	A
-H14	A	A	C	A	A	A	A	-H32	A	A	D	В	A	Α	A
-H16	A	В	C	Α	A	A	A	-H34	A	В	C	В	A	A	A
-H19	A	C	C	A	Α	A	A	-H36	A	C	C	В	A	A	Α
								-H38	A	C	C	В	A	A	A
1100-0	A	A	D	A	A	A	В				_				-
-H12	Α	A	D	A	A	Α	A	5050-0	A	A	D	В	A	A	В
-H14	Α	A	C	Α	A	A	Α	-H32	A	В	D	В	A	A	A
-H16	A	В	C	A	A	A	A	-H34	A	В	C	В	A	A	A
-H18	A	C	C	A	A	A	A	-H36	A	C	C	В	A	A	A
		_	-		_	_		-H38	Α	C	C	В	A	A	A
2014-T4	C	C	В	D	D	В	В				-	0		Α.	D
-T6	C	D	В	D	D	В	В	5052-0	A	A	D	C	A A	A	B A
	_	_	_	_	_	-	-	-H32	A	B	C	D	A	A	A
2024-T3	C	C	В	D	D	В	В	-H34	A		C	C	A	A	A
-T4	C	C	В	D	D	В	В	-H36	A	C	C	C	A	A	A
-T36	C	D	В	D	D	В	В	-H38	A	C	C	C	A	A	A
2002 0	٨	A	D	Α	Α	Α	В	5056-0	A	A	D	D	С	A	В
3003-0 -H12	A A	A	D	A	A	A	A	-H38	C	C	C	D	C	A	A
-H12	A	В	C	A	A	A	A	-1100	0	_	•		•		
-H14	A	C	C	A	A	A	A	5086-0	Α	A	D	D	C	Α	В
-H18	A	C	C	A	A	A	A	-H32	A	В	D	D	C	A	A
-1110	Α	0		11	**	**	**	-H34	В	В	C	D	C	A	Α
3004-0	A	A	D	В	В	A	В	-H36	В	C	C	D	C	A	A
-H32	A	В	D	В	В	A	A	-H38	В	C	C	D	C	A	A
-H34	A	В	C	В	В	A	A								
-H36	A	C	C	В	В	A	A	6061-0	A	A	D	Α	A	Α	В
-H38	A	C	C	В	В	A	A	- T 4	A	C	C	A	A	Α	Α
-100								- T 6	A	C	C	Α	Α	A	A
5005-0	A	A	D	В	A	A	В								
-H12	A	A	D	В	A	A	A	7075 - T6	C	D	В	D	D	D	В
-H14	A	В	C	В	A	A	A								

① Resistance to Corrosion, Workability (Cold), Machinability and Forgeability ratings A, B, C and D are relative ratings in decreasing order of merit. Weldability and Brazeability ratings A, B, C and D are relative ratings defined as follows:

A: Generally weldable by all commercial procedures and methods.

B: Weldable with special technique or on specific applications which justify preliminary trials or testing to develop welding procedure and weld performance.

C: Limited weldability because of crack sensitivity or loss in resistance to corrosion, and all mechanical properties.

D: No commonly used welding methods have so far been developed.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

MECHANICAL PROPERTY LIMITS-SHEET AND PLATE NON-HEAT TREATABLE ALLOYS

Alloy and	Thickness (e Strength si	Elongation in 2 Inches Percent (%)	
Temper	(mones)	Minimum	Maximum	Minimum	
		1100			
	0.006-0.019	11,000	15,500	15	
	0.020-0.031	11,000	15,500	20	
-0	0.032-0.050	11,000	15,500	25	
	0.051-0.249	11,000	15,500	30	
	0.250-3.000	11,000	15,500	28	
	0.017-0.019	14,000	19,000	3	
	0.020-0.031	14,000	19,000	4	
-H12 (3)	0.032-0.050	14,000	19,000	6	
	0.051-0.113	14,000	19,000	8	
	0.114-0.499	14,000	19,000	9	
	0.500-2.000	14,000	19,000	12	
	0.009-0.012	16,000	21,000	1	
	0.013-0.019	16,000	21,000	2	
	0.020-0.031	16,000	21,000	3	
-H14 (3)	0.032-0.050	16,000	21,000	4	
-1114 (9)	0.051-0.113	16,000	21,000	5	
	0.114-0.499			6	
		16,000	21,000		
	0.500-1.000	16,000	21,000	10	
11100	0.006-0.019	19,000	24,000	1	
-H16 ®	0.020-0.031	19,000	24,000	2	
	0.032-0.050	19,000	24,000	3	
	0.051-0.162	19,000	24,000	4	
**** 0	0.006-0.019	22,000	-	1	
-H18	0.020-0.031	22,000		2	
	0.032-0.050	22,000		3	
	0.051-0.128	22,000	Minu	4	
	0.250 - 0.499	13,000	Mille	9	
-H112	0.500-2.000	12,000		14	
	2.001-3.000	11,500	***	20	
-F ®	0.250-6.000	man a			
		3003			
	0.006-0.007	14,000	19,000	14	
	0.008-0.012	14,000	19,000	18	
-0	0.013-0.031	14,000	19,000	20	
	0.032-0.050	14,000	19,000	23	
	0.051-0.249			25	
-H12®					
		* .			
		,		-	
-Н12 ⑨	0.051-0.249 0.250-3.000 0.017-0.019 0.020-0.031 0.032-0.050 0.051-0.113 0.114-0.161 0.162-0.249 0.250-0.499 0.500-2.000	14,000 14,000 17,000 17,000 17,000 17,000 17,000 17,000 17,000 17,000	19,000 19,000 23,000 23,000 23,000 23,000 23,000 23,000 23,000 23,000 23,000	25 23 3 4 5 6 7 8 9	

① Sheet has a thickness of less than .250 inch.

Mechanical test specimens are taken parallel to the direction of rolling.

§ For the corresponding -H2 temper, maximum ultimate tensile values do not apply.

² Plate has a thickness of .250 inch and greater.

Tor sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch diameter specimen is used.

Mechanical properties not specified or guaranteed for -F temper plate.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

MECHANICAL PROPERTY LIMITS-SHEET AND PLATE 2

NON-HEAT-TREATABLE ALLOYS (3)

Alloy	Thickness ①	Ultimate	Strength	Elongation in 2 Inches
and Temper	(Inches)	Minimum	Maximum	Percent (%) Minimum
	3003	3-Continued		
	0.009-0.012	20,000	26,000	1
	0.013-0.019	20,000	26,000	2
	0.020-0.031	20,000	26,000	3
	0.032-0.050	20,000	26,000	4
3003-H14 ®	0.051-0.113	20,000	26,000	5
_	0.114-0.161	20,000	26,000	6
	0.162-0.249	20,000	26,000	7
	0.250 - 0.499	20,000	26,000	8
	0.500-1.000	20,000	26,000	10
	0.006-0.019	24,000	30,000	1
3003-H16®	0.020-0.031	24,000	30,000	2
	0.032-0.050	24,000	30,000	3
	0.051-0.162	24,000	30,000	4
	0.006-0.019	27,000		1
3003-H18	0.020-0.031	27,000		2
	0.032-0.050	27,000	-	3
	0.051-0.128	27,000		4
	0.250-0.499	17,000		8
3003-H112	0.500-2.000	15,000	-	12
	2.001-3.000	14,500	-	18
3003-F ®	0.250-6.000		_	_
	A	lclad 3003		
	0.006-0.007	13,000	18,000	14
	0.008-0.012	13,000	18,000	18
	0.013-0.031	13,000	18,000	20
Alclad 3003-0	0.032-0.050	13,000	18,000	23
	0.051 - 0.249	13,000	18,000	25
	0.250 - 0.499	13,000	18,000	23
	0.500 - 3.000	14,000 ⑦	19,000 ⑦	23
	0.017-0.031	16,000	22,000	4
	0.032-0.050	16,000	22,000	5
	0.051-0.113	16,000	22,000	6
Alclad 3003-H12 ®	0.114 - 0.161	16,000	22,000	7
	0.162 - 0.249	16,000	22,000	8
	0.250 - 0.499	16,000	22,000	9
	0.500 - 2.000	17,000 ⑦	23,000 ூ	10
	0.009-0.012	19,000	25,000	1
	0.013-0.019	19,000	25,000	2
	0.020-0.031	19,000	25,000	3
	0.032-0.050	19,000	25,000	4
Alclad 3003-H14 ®	0.051-0.113	19,000	25,000	5
	0.114-0.161	19,000	25,000	6
	0.162-0.249	19,000	25,000	7
	0.250 - 0.499	19,000	25,000	8
	0.500-1.000	20,000 ⑦	26,000 ூ	10

- ① Sheet has a thickness of less than .250 inch.
- 2 Plate has a thickness of .250 inch and greater.
- 3 Mechanical test specimens are taken parallel to the direction of rolling.
- For sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch diameter specimen is used.
- For the corresponding -H2 temper, maximum ultimate tensile values do not apply.
 Mechanical properties not specified or guaranteed for -F temper plate.
- This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding. Continued

ALUMINUM 47.

MECHANICAL PROPERTY LIMITS-SHEET AND PLATE *

NON-HEAT-TREATABLE ALLOYS (Continued)

Alloy	Thickness® (Inches)		Strength si	Elongation in 2 Inches
and Temper	(inches)	Minimum	Maximum	Percent (% Minimum
	Alclad	3003 - Continued		
	0.006-0.019	23,000	29,000	1
Alclad 3003-H16 (5)	0.020-0.031	23,000	29,000	2
	0.032 - 0.050	23,000	29,000	3
	0.051-0.162	24,000	30,000	4
	0.006-0.019	26,000	_	1
Alclad 3003-H18	0.020-0.031	26,000		2
	0.032-0.050	26,000	_	3
	0.051-0.128	26,000	_	4
	0.250-0.499	16,000		8
Alclad 3003-H112	0.500-2.000	15,000 ூ	_	12
	2.001-3.000	14,500 ூ		18
Alclad 3003-F ®	0.250-6.000	_	-	_
		3004		
	0.006-0.007	22,000	29,000	_
	0.008-0.019	22,000	29,000	10
3004-0	0.020-0.031	22,000	29,000	14
0001 0	0.032-0.050	22,000	29,000	16
	0.051-0.249	22,000	29,000	18
	0.250-3.000	22,000	29,000	16
	0.017-0.019	28,000	35,000	1
	0.020-0.031	28,000	35,000	3
3004-H32 ®	0.032-0.050	28,000	35,000	4
3004-1102	0.051-0.113	28,000	35,000	5
	0.114-2.000	28,000	35,000	6
	0.009-0.019	32,000	38,000	1
3004-H34 ®	0.020-0.019	32,000	38,000	3
3004-1134 @	0.051-0.113	32,000	38,000	4
	0.114-1.000	32,000	38,000	5
	0.006-0.007	35,000	41,000	
	0.008-0.007	35,000	41,000	1
3004-H36 ®	0.020-0.019	35,000	41,000	2
3004-1130 (3)	0.032-0.050	35,000	41,000	3
	0.051-0.162	35,000	41,000	4
			41,000	
	0.006-0.007 0.008-0.019	38,000 38,000		
3004-H38	0.020-0.031	38,000		1 2
001-H00	0.032-0.050	38,000		3
		38,000		4
2004 11110	0.051-0.128			
3004-H112	0.250-3.000	23,000	-	7
3004-F®	0.250-6.000		_	-

- ① Sheet has a thickness of less than .250 inch.
- 2 Plate has a thickness of .250 inch and greater.
- 3 Mechanical test specimens are taken parallel to the direction of rolling.
- Tor sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch diameter specimen is used.
- For the corresponding -H2 temper, maximum ultimate tensile values do not apply.
- Mechanical properties not specified or guaranteed for -F temper plate.
- This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.
- *Source Kaiser Aluminum & Chemical Sales, Inc.

MECHANICAL PROPERTY LIMITS-SHEET® AND PLATE®

NON-HEAT-TREATABLE ALLOYS (Continued)

Alloy	Thickness 4		Strength si	Elongation in 2 Inches Percent (%	
and Temper	(Inches)	Minimum	Maximum	Minimum	
	A	lclad 3004			
	0.006-0.007	21,000	28,000	_	
	0.008-0.019	21,000	28,000	10	
	0.020-0.031	21,000	28,000	14	
Alclad 3004-0	0.032-0.050	21,000	28,000	16	
	0.051-0.249	21,000	28,000	18	
	0.250-0.499	21,000	28,000	16	
	0.500-3.000	22,000 ⑦	29,000@	16	
	0.017-0.019	27,000	34,000	1	
	0.020-0.031	27,000	34,000	3	
Alclad 3004-H32®	0.032-0.050	27,000	34,000	4	
	0.051-0.113	27,000	34,000	5	
	0.114-0.249	27,000	34,000	6	
	0.009-0.019	31,000	37,000	1	
Alclad 3004-H34®	0.020-0.050	31,000	37,000	3	
	0.051-0.113	31,000	37,000	4	
	0.114 - 0.249	31,000	37,000	5	
	0.006-0.007	34,000	40,000	-	
	0.008-0.019	34,000	40,000	1	
Alclad 3004-H36®	0.020-0.031	34,000	40,000	2	
	0.032-0.050	34,000	40,000	3	
	0.051-0.162	34,000	40,000	4	
	0.006-0.007	37,000			
	0.008-0.019	37,000		1	
Alclad 3004-H38	0.020-0.031	37,000	_	2	
	0.032-0.050	37,000	_	3	
	0.051-0.128	37,000	_	4	
Alclad 3004-H112	0.250-0.499	22,000		7	
	0.500-3.000	23,000 ⑦		7	
Alclad 3004-F®	0.250-6.000	_		_	
		5005			
	0.006-0.007	14,000	20,000	14	
	0.008-0.012	14,000	20,000	16	
	0.013-0.019	14,000	20,000	18	
5005-0	0.020-0.031	14,000	20,000	20	
	0.032-0.113	14,000	20,000	22	
	0.114 - 0.249	14,000	20,000	24	
	0.250 - 3.000	14,000	20,000	22	
	0.017-0.019	17,000	23,000	2	
	0.020-0.031	17,000	23,000	3	
	0.032-0.050	17,000	23,000	4	
	0.051 - 0.113	17,000	23,000	6	
5005-H12	0.114-0.161	17,000	23,000	7	
	0.162-0.249	17,000	23,000	8	
	0.250-0.499	17,000	23,000	9	
	0.500-2.000	17,000	23,000	10	

- ① Sheet has a thickness of less than .250 inch. ③ Plate has a thickness of .250 inch and greater.
- 3 Mechanical test specimens are taken parallel to the direction of rolling.
- Tor sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch diameter specimen is used.
- For the corresponding -H2 temper, maximum ultimate tensile values do not apply.
- ® Mechanical properties not specified or guaranteed for -F temper plate.
- This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.

MECHANICAL PROPERTY LIMITS- SHEET ® AND PLATE®

NON-HEAT-TREATABLE ALLOYS (Continued)

Alloy	Thickness@		e Strength si	Elongation in 2 Inches Percent (%	
and Temper	(Inches)	Minimum	Maximum	Minimum	
	500	5-Continued			
	0.009-0.031	20,000	26,000	1	
	0.032-0.050	20,000	26,000	2	
	0.051-0.113	20,000	26,000	3	
5005-H14	0.114-0.161	20,000	26,000	5	
	0.162-0.249	20,000	26,000	6	
	0.250-0.499	20,000	26,000	8	
	0.500-1.000	20,000	26,000	10	
	0.006-0.031	24,000	30,000	1	
5005-H16	0.032-0.050	24,000	30,000	2	
0000 11=0	0.051-0.128	24,000	30,000	3	
	0.006-0.031	27,000	_	1	
5005-H18	0.032-0.050	27,000		2	
0000 1110	0.051-0.162	27,000	_	3	
	0.017-0.019	17,000	23,000	3	
5005-H32 ⑤	0.020-0.031	17,000	23,000	4	
	0.032-0.050	17,000	23,000	5	
	0.051-0.113	17,000	23,000	7	
	0.114-0.161	17,000	23,000	8	
	0.162-0.249	17,000	23,000	9	
	0.250-2.000	17,000	23,000	10	
	0.009-0.012	20,000	26,000	2	
	0.013-0.031	20,000	26,000	3	
	0.032-0.050	20,000	26,000	4	
	0.051-0.113	20,000	26,000	5	
5005-H34®	0.114-0.161	20,000	26,000	6	
0000 11010	0.162-0.249	20,000	26,000	7	
	0.250-0.499	20,000	26,000	8	
	0.500-1.000	20,000	26,000	10	
	0.006-0.007	23,000	29,000	1	
5005-H36®	0.008-0.019	23,000	29,000	2	
3003-1130@	0.020-0.031	23,000	29,000	3	
	0.032-0.128	23,000	29,000	4	
	0.006-0.012	26,000		1	
5005-H38	0.013-0.019	26,000		2	
3003-1130	0.020-0.031	26,000	_	3	
	0.032-0.162	26,000	_	4	
5005-F®	0.250-6.000	_	_		
		5050			
	0.006.0.007		24,000		
	0.006-0.007	18,000 18,000	24,000	16	
	0.008-0.019		24,000	18	
5050 0	0.020-0.031	18,000		20	
5050-0	0.032-0.113	18,000	24,000	20	
	0.114-0.249	18,000	24,000	20	
	0.250-3.000	18,000	24,000	20	

¹ Sheet has a thickness of less than .250 inch.

² Plate has a thickness of .250 inch and greater.

³ Mechanical test specimens are taken parallel to the direction of rolling.

For sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch diameter specimen is used.

[®] For the corresponding -H2 temper, maximum ultimate tensile values do not apply.

[®] Mathematical properties not specified or guaranteed for -F temper plate.

MECHANICAL PROPERTY LIMITS- SHEET AND PLATE 2

NON-HEAT-TREATABLE ALLOYS (Continued)

Alloy	Thickness®		e Strength si	Elongation in 2 Inches Percent (%
Temper	(Inches)	Minimum	Maximum	Minimum
	505	0—Continued		
5050-H32®	0.017-0.050	22,000	28,000	4
	0.051 - 0.249	22,000	28,000	6
	0.009-0.031	25,000	31,000	3
5050-H34®	0.032-0.050	25,000	31,000	4
	0.051-0.249	25,000	31,000	5
	0.008-0.019	27,000	33,000	2
5050-H36®	0.020-0.050	27,000	33,000	3
3030-1130@	0.051-0.162	27,000	33,000	4
	0.006-0.007	29,000		
5050-H38	0.008-0.001	29,000	_	2
5050-H38				3
	0.032-0.050	29,000		4
	0.051-0.128	29,000		12
5050-H112	0.250-3.000	20,000		14
5050-F®	0.250-6.000			
		5052		
	0.006-0.007	25,000	31,000	_
	0.008-0.019	25,000	31,000	15
5052-0	0.020 - 0.031	25,000	31,000	18
	0.032 - 0.249	25,000	31,000	20
	0.250-3.000	25,000	31,000	18
	0.017-0.019	31,000	38,000	4
	0.020-0.050	31,000	38,000	5
5052-H32®	0.051-0.113	31,000	38,000	7
0002 11020	0.114-0.249	31,000	38,000	9
	0.250-0.499	31,000	38,000	11
	0.500-2.000	31,000	38,000	12
	0.009-0.019	34,000	41,000	3
	0.020-0.050	34,000	41,000	4
5052-H34®	0.051-0.113	34,000	41,000	6
0002-11019	0.114-0.249	34,000	41,000	7
	0.250-1.000	34,000	41,000	10
	0.006-0.007	37,000	44,000	
5052-H36®	0.008-0.007	37,000	44,000	3
0002-H30®	0.008-0.031	37,000	44,000	4
			44,000	7
EOED MOO	0.006-0.007	39,000		3
5052-H38	0.008-0.031	39,000		4
	0.032-0.128	39,000		7
F0F0 *** 10	0.250-0.499	28,000		
5052-H112	0.500-2.000	25,000		12
	2.001-3.000	25,000		16
5052-F®	0.250 - 6.000		_	

¹ Sheet has a thickness of less than .250 inch.

3 Mechanical test specimens are taken parallel to the direction of rolling.

² Plate has a thickness of .250 inch and greater.

Tor sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch diameter specimen is used.

⑤ For the corresponding -H2 temper, maximum ultimate tensile values do not apply.

¹ Mechanical properties not specified or guaranteed for -F temper plate.

MECHANICAL PROPERTY LIMITS—SHEET ① AND PLATE ② HEAT-TREATABLE ALLOYS ③

Alloy and Temper	Width (Inches)	Thickness ₍₎	Nominal Cladding Thickness	Strength Minim	ıum	Elongation in 2 Inches Percent (%)
			Per Side	Ultimate	Yield	Minimum
		2014				
	All	0.250-1.500	_	67,000	59,000	4
2014-T6 & T651 Plate	All	1.501-2.000	_	65,000	59,000	3
	All	2.001-3.000	-	63,000	57,000	2
		Alclad 2014				
Alclad 2014-0 Sheet and plate ®	All	0.020-0.499	9	30,000®	14,000®	16
	All	0.500-1.000	2 1/2%	30,000® ®		16
Alclad 2014-T3 Flat Sheet	All	0.020-0.039	9	55,000	35,000	14
	All	0.040-0.249	9	57,000	36,000	15
Alclad 2014-T4 Coiled sheet (and	All	0.020-0.039	(9)	55,000	32,000	14
flat sheet heat	All	0.040-0.128	9	57,000	34,000	15
treated by the	All	0.129-0.249	2 1/2%	57,000	34,000	15
user) 🗇				,	,	
Alclad 2014-T4 & T451 Plate	All	0.250-0.499	2 1/2%	57,000	36,000	15
	All	0.500-1.000	2 1/2%	58,000®	36,000®	15
Alclad 2014-T42 Plate heat	All	0.250-0.499	2 1/2%	57,000	34,000	15
treated by the	All	0.500-1.000	2 1/2%	58,000®	34,000®	15
user 7						
	All	0.020-0.039	9	63,000	55,000	7
	All	0.040-0.499	(9)	64,000	57,000	8
Alclad 2014-T6 & T651 Sheet and	All	0.500-1.000	2 1/2%	67,000®	59,000®	6
plate	All	1.001-1.500	2 1/2%	67,000®	59,000®	4
	A11	1.501-2.000	2 1/2%	65,000®	59,000®	3
	All	2.001-3.000	2 1/2%	63,000®	57,000®	2
		2024				
2024-0 Sheet and plate®	All	0.010-0.499	_	32,000®	14,000	12
. 0	All	0.500-1.750	_	32,000®	_	8
	All	0.010-0.020	_	64,000	42,000	12
2004 770 771 1 1	All	0.021-0.051	_	64,000	42,000	15
2024-T3 Flat sheet	All	0.052-0.128		64,000	42,000	17
	All	0.129-0.249		64,000	42,000	15
	30 & under	0.020-0.500	_	69,000	52,000	10
	Over 30	(0.020-0.062	_	69,000	52,000	10
	thru 48	0.063-0.249	_	69,000	52,000	10
		0.250-0.500	_	69,000	52,000	10
2024-T36 Flat sheet and	Over 48	(0.020-0.062	_	67,000	50,000	10
plate	thru 60	0.063-0.249	_	68,000	51,000	10
		0.250-0.500	-	67,000	50,000	10
	Over 60	50.063-0.249	_	67,000	50,000	10
	CAST OO	0.250-0.500	_	66,000	49,000	10

- (1) Sheet has a thickness of less than .250 inch.
- 3 Plate has a thickness of .250 inch and greater.
- ® Mechanical test specimens are taken perpendicular to the direction of rolling for widths 9 inches and greater, and parallel to the direction of rolling for widths less than 9 inches.
- For sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch specimen is used.
- (5) Maximum. So specified to insure complete annealing.
- Annealed (-O temper) sheet shall upon heat treatment be capable of developing the mechanical properties applicable to -T4 temper sheet and annealed (-O temper) plate shall upon heat treatment be capable of developing the mechanical properties applicable to -T42 temper plate.
- Material heat treated from any temper by the user should attain the mechanical properties applicable to this temper.
- This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.
- Cladding thicknesses vary from 10 percent to 2 1/2 percent depending on thickness of sheet or plate.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

MECHANICAL PROPERTY LIMITS—SHEET ① AND PLATE ③ HEAT-TREATABLE ALLOYS③—Continued

Alloy and Temper	Width	Thickness®	Nominal Cladding	Strength Minim		Elongation in 2 Inches Percent (%)
,,	(Inches)	(Inches)	Thickness Per Side	Ultimate	Yield	Minimum
	20	024 - Continued				
2024-T4 Coiled sheet (and	All	0.010-0.020		62,000	40,000	12
flat sheet heat-	All	0.021-0.051	-	62,000	40,000	15
treated by the	All	0.052-0.128		62,000	40,000	17
user) 🐨	All	0.129-0.249	-	62,000	40,000	15
	All	0.250-0.499		64,000	40,000	12
	All	0.500-1.000		62,000	40,000	8
2024-T4 & T351 Plate	All	1.001-1.500		60,000	40,000	7
	All	1.501-2.000		60,000	40,000	6 4
	All	2.001-3.000		56,000	40,000	
	All	0.250-0.499		64,000	38,000	12
2024-T42 Plate heat	All	0.500-1.000		62,000	38,000	8
treated by the	All	1.001-1.500	-	60,000	38,000	7
user 🗇	All	1.501-2.000	_	60,000	38,000	6 4
	All	2.001-3.000	-	56,000	38,000	
2024-T6 Sheet and plate	All	0.012-0.499		64,000	50,000	5
heat—treated and aged by the user ⑦	All	0.500 & over	-	63,000	50,000	5
2024-T81 & T851 Flat	All	0.010-0.499	_	67,000	58,000	5
sheet and plate	All	0.500-1.000	-	66,000	58,000	5
		0.020-0.062	_	72,000	66,000	3
	30 & under	0.063-0.249	_	72,000	68,000	4
		0.250-0.500	_	72,000	67,000	4
		(0.020-0.062	_	72,000	66,000	3
2024-T86 Flat sheet and	Over 30	0.063-0.249	-	72,000	67,000	4
plate	thru 48	0.250-0.500	-	71,000	66,000	4
piate	0 10	(0,020-0.062	_	70,000	62,000	3
	Over 48 thru 60	0.063-0.249		71,000	67,000	4
	tiiru 60	0.250-0.500	_	70,000	65,000	4
	0	0.063-0.249	-	71,000	66,000	4
	Over 60	10.250-0.500		70,000	64,000	4
		Alclad 2024				
	All	0.008-0.009	5%	30,000®	14,000®	7
	All	0.010-0.032	5%	30,000®	14,000®	8
	All	0.033-0.062	5%	30,000®	14,000®	10
Alclad 2024-0 Sheet and plate®	All	0.063-0.187	2 1/2%	32,000®	14,000®	12
Altiau 2024-0 Sheet and plate 6	All	0.188-0.499	12 1/2%	32,000®	14,000®	12
			1 1/2%	32,000®	14,000®	12
	All	0.500-1.750	2 1/2%	32,000® ®	-	8
			1 1/2%	32,000 3 8	_	8

- 1 Sheet has a thickness of less than .250 inch.
- ② Plate has a thickness of .250 inch and greater.
- Mechanical test specimens are taken perpendicular to the direction of rolling for widths 9 inches and
 greater, and parallel to the direction of rolling for widths less than 9 inches.
- Tor sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch specimen is used.
- Maximum. So specified to insure complete annealing.
- Annealed (-O temper) material shall upon heat treatment be capable of developing the mechanical propperties applicable to -T42 temper material.
- Material heat treated from any temper by the user should attain the mechanical properties applicable to this temper.
- This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.

MECHANICAL PROPERTY LIMITS—SHEET ① AND PLATE ②
HEAT-TREATABLE ALLOYS ③ —Continued

Alloy and Temper	Width	Thickness	Nominal Cladding	Strengt! Minin		Elongation in 2 Inches
Time y and a compet	(Inches)	(Inches)	Thickness Per Side	Ultimate	Yield	Percent (%)
	Alcla	ad 2024—Conti	nued			
Alclad 2024-T3 Flat sheet	All All All All All	0.008-0.009 0.010-0.020 0.021-0.062 0.063-0.128 0.129-0.187 0.188-0.249	5% 5% 5% 2 1/2% 2 1/2% 2 1/2% 1 1/2%	58,000 59,000 59,000 62,000 62,000 62,000 63,000	39,000 39,000 39,000 40,000 40,000 40,000 41,000	10 12 15 15 13 13
		0.020-0.062 0.063-0.187	5% 2 1/2%	62,000 66,000	48,000 50,000	8 9
	30 & under	0.188-0.249		66,000 67,000	50,000 51,000	9
Alclad 2024-T36 Flat sheet and plate	50 & under	0.250-0.499	{2 1/2% 1 1/2%	66,000 67,000	50,000 51,000	9
		0.500	{2 1/2% 1 1/2%	69,000® 69,000®	52,000® 52,000®	10 10
	Over 30 thru 48	$\begin{cases} 0.020 - 0.062\\ 0.063 - 0.187\\ 0.188 - 0.249\\ 0.250 - 0.499\\ 0.500 \end{cases}$	5% 2 1/2% {2 1/2% {1 1/2% {1 1/2% }1 1/2% {1 1/2% }1 1/2%	62,000 66,000 66,000 67,000 66,000 67,000 69,000® 69,000®	48,000 50,000 50,000 51,000 50,000 51,000 52,000 52,000	8 9 9 9 9 10
	Over 48 thru 60	$\begin{cases} 0.020 - 0.062 \\ 0.063 - 0.187 \\ 0.188 - 0.249 \\ 0.250 - 0.499 \\ 0.500 \end{cases}$	5% 2 1/2% 52 1/2% 11 1/2% 11 1/2% 11 1/2% 12 1/2% 11 1/2%	61,000 65,000 65,000 66,000 65,000 66,000 67,000® 67,000®	47,000 49,000 49,000 50,000 49,000 49,000 50,000 50,000	8 9 9 9 9 9 10
	Over 60	0.063-0.187 0.188-0.249 0.250-0.499 0.500	2 1/2% {2 1/2% {1 1/2% {2 1/2% {1 1/2% {1 1/2% {2 1/2% {1 1/2%	64,000 64,000 65,000 64,000 65,000 66,000 66,000	48,000 48,000 49,000 48,000 48,000 49,000 49,000	9 9 9 9 9 10
Alclad 2024-T4 Coiled sheet	All All All	0.010-0.020 0.021-0.062 0.063-0.128	5% 5% 2 1/2%	58,000 58,000 61,000	37,000 37,000 38,000	12 15 15

¹ Sheet has a thickness of less than .250 inch.

² Plate has a thickness of .250 inch and greater.

Mechanical test specimens are taken perpendicular to the direction of rolling for widths 9 inches and greater, and parallel to the direction of rolling for widths less than 9 inches.

Tor sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch specimen is used.

This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

MECHANICAL PROPERTY LIMITS—SHEET ① AND PLATE ②
HEAT-TREATABLE ALLOYS ③ —Continued

Alloy and Temper	Width	Thickness@	Nominal Cladding	Strengtl Minin		Elongation in 2 Inches
The state of the s	(Inches)	(Inches)	Thickness Per Side	Ultimate	Yield	Percent (% Minimum
	Alcla	ad 2024—Conti	nued			
	All	0.250-0.499	${ \begin{cases} 2 \ 1/2\% \\ 1 \ 1/2\% \end{cases} }$	62,000 63,000	40,000	11 11
	All	0.500-1.000	{2 1/2% 1 1/2%	62,000 ® 62,000 ®	40,000® 40,000®	8
Alclad 2024-T4 & T351 Plate	All	1.001-1.500	{2 1/2% 1 1/2%	60,000®	40,000 ®	7 7
	All	1.501-2.000	{2 1/2% 1 1/2%	60,000 ® 60,000 ®	40,000 ®	6 6 4
	All	2.001-3.000	{2 1/2% 1 1/2%	56,000® 56,000®	40,000® 40,000®	4
	All	0.008-0.009	5%	55,000	34,000	10
	All	0.010-0.020	5%	56,000	34,000	12
	All	0.021-0.062	5%	56,000	34,000	15
	All	0.063-0.187	2 1/2%	59,000	36,000	15
	All	0.188-0.249	{2 1/2% 1 1/2%	59,000 60,000	36,000 37,000 38,000 38,000 38,000 ®	15 15
Alclad 2024-T42 Sheet and plate heat treated by	All	0.250-0.499	(1 1/2%	62,000 63,000		11 11
the user ®	All	0.500-1.000	1 1/2%	62,000 ® 62,000 ® 60,000 ®	38,000 ® 38,000 ®	8 8 7
	All	1.001-1.500	1 1/2%	60,000 ®	38,000 ®	7
	All	1.501-2.000	$ \begin{cases} 2 \ 1/2\% \\ 1 \ 1/2\% \end{cases} $	60,000® 60,000®	38,000 ® 38,000 ®	6
	All	2.001-3.000		56,000 ® 56,000 ®	38,000® 38,000®	4 4
Alclad 2024-T6 Sheet and plate	All	0.010-0.062	5%	60,000	47,000	8
heat treated and	All	0.063-0.187	2 1/2%	62,000	49,000	8
aged by the user ⑤	All	0.188-0.499	1 1/2%	62,000 62,000	49,000 49,000	8
	All	0.010-0.062	5%	62,000	54,000	5
11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	All	0.063-0.187	2 1/2%	65,000	56,000	5
Alclad 2024-T81 & T851 Flat sheet and plate	All	0.188-0.499	1 1/2%	65,000	56,000	5 5 5
	All	0.500-1.000	{2 1/2% 1 1/2%	66,000 ® 66,000 ®	58,000® 58,000®	5
		0.020-0.062	5% 2 1/2%	66,000 70,000	62,000 66,000	3 4
Alclad 2024-T86 Flat sheet and	20 %	0.188-0.249	$ \begin{cases} 2 & 1/2\% \\ 1 & 1/2\% \end{cases} $	70,000	66,000 67,000	4
plate	30 & under	0.250-0.499	{2 1/2% 1 1/2%	70,000 71,000	65,000 66,000	4
		0.500		72,000 ® 72,000 ®	67,000 ® 67,000 ®	4

① Sheet has a thickness of less than .250 inch.

² Plate has a thickness of .250 inch and greater.

<sup>Mechanical test specimens are taken perpendicular to the direction of rolling for widths 9 inches and
greater, and parallel to the direction of rolling for widths less than 9 inches.</sup>

For sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch specimen is used.

Material heat treated from any temper by the user should attain the mechanical properties applicable to this temper.

This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.

^{*}Source - Kaiser Aluminum & Chemical Co.

MECHANICAL PROPERTY LIMITS—SHEET ① AND PLATE③
HEAT-TREATABLE ALLOYS ③ —Continued

Alloy and Temper	Width	Thickness®	Nominal Cladding	Strengtl Minin		Elongation in 2 Inches
may and I compor	(Inches)	(Inches)	Thickness Per Side	Ultimate	Yield	Percent (%) Minimum
	Alcl	ad 2024—Conti	nued			
		0.020-0.062	5%	66,000	62,000	3
		0.063-0.187	2 1/2%	70,000	65,000	4
		0.188-0.249	12 1/2%	70,000	65,000	4
	Over 30	0.100-0.249	1 1/2%	71,000	66,000	4
	thru 48	0.250-0.499	52 1/2%	69,000	64,000	4
		0.200-0.400	11 1/2%	70,000	65,000	4
		0.500	12 1/2%	71,000 @	66,000®	4
		(0.300	1 1/2%	71,000®	66,000 ®	4
		0.020-0.062	5%	64,000	58,000	3
		0.063-0.187	2 1/2%	69,000	65,000	4
		0 100 0 040	(2 1/2%	69,000	65,000	4
Alclad 2024-T86 Flat sheet and	Over 48	0.188-0.249	1 1/2%	70,000	66,000	4
plate	thru 60	0 050 0 400	(2 1/2%	68,000	63,000	4
(Continued)		0.250-0.499	1 1/2%	69,000	64,000	4
		0.500	52 1/2%	70,000®	65,000®	4
		0.500	1 1/2%	70,000®	65,000 ®	4
		0.063-0.187	2 1/2%	69,000	64,000	4
			(2 1/2%	69,000	64,000	4
		0.188-0.249	1 1/2%	70,000	65,000	4
	Over 60	K 0 050 0 400	(2 1/2%	68,000	62,000	4
		0.250-0.499	1 1/2%	69,000	63,000	4
		0.500	12 1/2%	70,000 ®	64,000 ®	4
		(0.500	1 1/2%	70,000®	64,000 ®	4
		6061				
	All	0.010-0.020	-	22,000®	12,000⑤	14
	All	0.021-0.128	_	22,000®	12,000®	16
6061-0 Sheet and plate T	All	0.129-0.499	_	22,000®	12,000®	18
	All	0.500-1.000	-	22,000®	-	18
	All	1.001-3.000		22,000®	_	16
	All	0.010-0.020	_	30,000	16,000	14
6061-T4 & T451 Sheet and	All	0.021-0.249	_	30,000	16,000	16
plate	All	0.250-1.000	-	30,000	16,000	18
-	All	1.001-3.000	-	30,000	16,000	16
	All	0.010-0.020	-	42,000	35,000	8
6061-T6 & T651 Sheet and	A11	0.021-0.499	_	42,000	35,000	10
plate	All	0.500-1.000	_	42,000	35,000	9
plate	All	1.001-2.000		42,000	35,000	8
	All	2.001-3.000	_	42,000	35,000	6
		Alclad 6061				
	All	0.010-0.020	5%	20,000®	12,000®	14
Alclad 6061-0 Sheet and plate®	All	0.021-0.128	5%	20,000®	12,000®	16
	All	0.129-0.499	5%	20,000®	12,000®	18
	All	0.500	5%	22,000 5 6	-	_

① Sheet has a thickness of less than .250 inch.

2 Plate has a thickness of .250 inch and greater.

Mechanical test specimens are taken perpendicular to the direction of rolling for widths 9 inches and greater, and parallel to the direction of rolling for widths less than 9 inches.

• For sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch specimen is used.

Maximum. So specified to insure complete annealing.

This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.

nnealed (-0 temper) material shall upon heat treatment and aging be capable of developing the mechanical properties applicable to -T6 temper material.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

MECHANICAL PROPERTY LIMITS—SHEET @ AND PLATE @ HEAT-TREATABLE ALLOYS @ —Continued

Alloy and Temper	Width (Inches)	Thickness@ (Inches)	Nominal Cladding Thickness	Strength	ıum	Elongation in 2 Inches Percent (%) Minimum
	41-1	ad 6061 Conti	Per Side	Ultimate	Yield	Minimum
				1 1		
	All	0.010-0.020	5%	27,000	14,000	14
Alclad 6061-T4 & T451 Sheet and	All	0.021-0.249	5%	27,000	14,000	16 18
plate	All All	0.250-0.499	5% 5%	27,000 30,000 ⑦	14,000 16,000®	18
	All	0.010-0.020	5%	38,000	32,000	8
Alclad 6061-T6 & T651 Sheet and	All	0.021-0.499	5%	38,000	32,000	10
plate	All	0.500	5%	42,000 ⑦	35,000 ூ	9
		7075				
7075-0 Sheet and plate ®	All	0.015-0.499	-	40,000®	21,000®	10
•	All	0.500-2.000	-	40,000®	-	10
	All	0.015-0.039	_	76,000	65,000	7
	All	0.040-0.499	-	77,000	66,000	8
7075-T6 & T651 Sheet and	All	0.500-1.000		77,000	66,000	6
plate	All	1.001-2.000	-	77,000	66,000	4
	A11	2.001-2.500	_	73,000	62,000	3
	All	2.501-3.000	_	70,000	60,000	3
		Alclad 7075				
	All	0.008-0.014	4%	36,000®	20,000®	9
	All	0.015-0.062	4 %	36,000®	20,000®	10
	A11	0.063-0.187	§ 4%®	36,000®	20,000®	10
Alclad 7075-0 Sheet and plate ®	All	0.003-0.101	12 1/2%	38,000®	20,000®	10
Arciau 1013-0 Bheet and plate @	All	0.188-0.499	1 4%®	36,000®	20,000®	10
	1	01200 01100	11 1/2%	39,000®	21,000®	10
	A11	0.500-1.000	{ 4%®	40,000® ⑦		10 10
			11 1/2%	40,000® ⑦	-	
	All	0.008-0.011	4%	68,000	58,000	5
	All	0.012-0.039	4%	70,000	60,000	7 8
	All	0.040-0.062	4%	72,000	62,000 62,000	8
	All	0.063-0.187	{ 4%® 2 1/2%	72,000	63,000	8
	4.11	0 100 0 100	(4%8	72,000	62,000	8
Alclad 7075-T6 & T651 Sheet and	All	0.188-0.499	1 1/2%	75,000	64,000	8
plate	All	0.500-1.000	{ 4%®	77,000 €	66,000⊕	6
prate	AII	0.000-1.000	1 1/2%	77,000 ⑦	66,000@	6
	All	1.001-2.000	{ 4%®	77,000 ⑦	66,000 ூ	4
	*****	1.001-2.000	1 1/2%	77,000 ⑦	66,000 ⑦	4
	A11	2,001-2,500	{ 4% ®	73,000 ⑦	62,000 ⑦	3 3
		2.000	11 1/2%	73,000 ⑦	62,000 @	3
	All	2,501-3,000	4%3	70,000 ⑦	60,000®	3
			1 1/2%	70,000 ⑦	00,000@	J.

⁽¹⁾ Sheet has a thickness of less than .250 inch.

2 Plate has a thickness of .250 inch and greater.

Mechanical test specimens are taken perpendicular to the direction of rolling for widths 9 inches and greater, and parallel to the direction of rolling for widths less than 9 inches.

Tor sheet and plate under 1/2 inch in thickness, the standard 1/2 inch wide tension test specimen is used; for plate 1/2 inch and over in thickness, the standard 1/2 inch diameter specimen or a similar round specimen having the maximum possible dimensions proportional to those of the standard 1/2 inch specimen is used.

Maximum. So specified to insure complete annealing.

 Annealed (-O-temper) material shall upon heat treatment and aging be capable of developing the mechanical properties applicable to -T6 temper material.

This table specifies the properties applicable to the test specimens, and since for plate 0.500 inch or over in thickness the cladding material is removed during the preparation of the test specimens, the listed properties are applicable to the core material only. Tensile and yield strengths of the composite plate are slightly lower depending on the thickness of cladding.

® The 4 percent nominal cladding thickness for Alclad 7075 in thickness 0.063 inch and over is obsolete.

Mechanical property limits are shown for this material for information only.



CHASE ALUMINUM*

TYPICAL MECHANICAL PROPERTIES @ SHEET AND PLATE

		Tension	n	Hardness	Shear	Bearing	Fatigue	Modulus	
Alloy and	Stre	ngth	Elongation in 2 Inches Percent (%)	Brinell Number	Ultimate Shearing	Ultimate@ Bearing	Endur- ance ③	Modulus € of	
Temper	Ultimate	Yield	1/16 Inch Thick Specimen	500 Kg Load 10mm Ball	Strength psi	Strength psi	Limit psi	Elasticity psi	
1100-0	13,000	5,000	35	23	9,000	27,000	5,000	10.0 x 10 ⁶	
1100-H12	16,000	15,000	12	28	10,000	29,000	6,000	10.0 x 106	
1100-H14	18,000	17,000	9	32	11,000	31,000	7,000	10.0 x 106	
1100-H16	21,000	20,000	6	38	12,000	34,000	9,000	10.0 x 106	
1100-H18	24,000	22,000	5	44	13,000	38,000	9,000	10.0 x 10	
2014-0	27,000	14,000	_	45	18,000	_	13,000	10.6 x 106	
2014-T4	62,000	42,000	_	105	38,000	_	20,000	10.6 x 10	
2014-T6	70.000	60,000	_	135	42,000	_	18,000	10.6 x 10 ⁶	
Alclad 2014-0	25,000	10,000	21	-	18,000	_	10,000	10.5 x 10	
Alclad 2014-0		40,000	20		37,000	_	_	10.5 x 10 ⁶	
	63,000®			_		_	_	10.5 x 10 ⁶	
Alclad 2014-T4	61,000®	37,000®	22 10	_	37,000	100,000	_		
Alclad 2014-T6	68,000®	60,000®			41,000	129,000	-	10.5 x 10 ⁶	
2024-0	27,000	11,000	20	47	18,000	100.000	13,000	10.6 x 10 ⁶	
2024-T3	70,000	50,000	18	120	41,000	129,000	20,000	10.6 x 10 ⁶	
2024-T4	68,000	47,000	20	120	41,000		20,000	10.6 x 106	
2024-T36	72,000	57,000	13	130	42,000	139,000	18,000	10.6 x 10 ⁶	
Alclad 2024-0	26,000	11,000	20	-	18,000	_	-	10.6 x 106	
Alclad 2024-T3	65,000 ®	45,000®	18	-	40,000	122,000	_	10.6 x 106	
Alclad 2024-T4	64,000 ®	42,000 ®	19	_	40,000	-	_	10.6 x 106	
Alclad 2024-T36	67,000 ®	53,000 ®	11	_	41,000	127,000	_	10.6 x 10 ⁶	
Alclad 2024-T81	65,000 €	60,000®	6	_	40,000	_	_	10.6 x 10	
Alclad 2024-T86	70,000 ®	66,000®	6	_	42,000	-	_	10.6 x 10 ⁶	
3003-0	16,000	6,000	30	28	11,000	34,000	7,000	10.0 x 106	
3003-H12	19,000	18,000	10	35	12,000	36,000	8,000	10.0 x 106	
3003-H14	22,000	21,000	8	40	14,000	38,000	9,000	10.0 x 106	
3003-H16	26,000	25,000	5	47	15,000	42,000	10,000	10.0 x 106	
3003-H18	29,000	27,000	4	55	16,000	46,000	10,000	10.0 x 10 ⁶	
Alclad 3003-0	16,000	6,000	30	_	11,000	_	_	10.0 x 10 ⁶	
Alclad 3003-H12	19,000	18,000	10	_	12,000	_		10.0 x 106	
Alclad 3003-H14	22,000	21,000	8	_	14,000	_	_	10.0 x 106	
Alclad 3003-H16	26,000	25,000	5	_	15,000	_	_	10.0 x 106	
Alclad 3003-H18	29,000	27,000	4	_	16,000	_		10.0 x 106	
3004-0	26,000	10,000	20	45	16,000	_	14,000	10.0 x 10 ⁶	
3004-H32	31,000	25,000	10	52	17,000	_	15,000	10.0 x 10 ⁶	
3004-H34	35,000	29,000	9	63	18,000	_	15,000	10.0 x 10 ⁶	
3004-H36	38,000	33,000	5	70	20,000		16,000	10.0 x 10 ⁶	
3004-H38	41,000	36,000	5	77	21,000	_	16,000	10.0 x 10 ⁶	
Alclad 3004-0		10,000	20		16,000	_	-	10.0 x 10 ⁶	
	26,000		10					10.0 x 10 ⁶	
Alclad 3004-H32	31,000	25,000	9	_	17,000	_	_	10.0 x 10 ⁶	
Alclad 3004-H34	35,000	29,000		1	18,000				
Alclad 3004-H36	38,000	33,000	5	_	20,000	-	-	10.0 x 10 ⁶	
Alclad 3004-H38	41,000	36,000	5	-	21,000	_		10.0 x 10 ⁶	
5005-0	18,000	6,000	30	28	11,000	-	-	10.0 x 10 ⁶	
5005-H12	20,000	19,000	10	_	14,000	_	_	10.0 x 10 ⁶	
5005-H14	23,000	22,000	6	_	14,000	_	-	10.0 x 106	
5005-H16	26,000	25,000	5	_	15,000	_	-	10.0 x 106	
5005-H18	29,000	28,000	4	_	16,000	_	-	10.0 x 10	
5005-H32	20,000	17,000	11	36	14,000	_	_	10.0 x 106	
5005-H34	23,000	20,000	8	41	14,000	_	_	10.0 x 106	
5005-H36	26,000	24,000	6	46	15,000	_		10.0 x 106	
5005-H38	29,000	27,000	5	51	16,000	_		10.0 x 106	

¹ Properties listed are for information only and are not guaranteed.

② Ultimate bearing strength with edge distance 2.0 times rivet diameter.

[®] Based on 500,000,000 cycles of completely reversed stress using the R. R. Moore type of machine and specimen.

Average of tension and compression moduli. Compression modulus is about 2% greater than tension modulus.

[®] Sheet less than .040 inch thick will have strengths slightly lower than these values.

Sheet more than .062 inch thick will have strengths slightly higher than these values.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.

TYPICAL MECHANICAL PROPERTIES SHEET AND PLATE

Continued

		Tens	ion	Hardness	Shear	Bearing	Fatigue	Modulus
Alloy and		ngth si	Elongation in 2 Inches Percent (%) 1/16 Inch	Brinell Number	Ultimate Shearing	Ultimate@ Bearing	Endur- ance®	Modulus@
Temper	Ultimate	Ultimate Yield		500 Kg Load 10mm Ball	Strength psi	Strength psi	Limit psi	Elasticity psi
5050-0	21,000	8,000	24	36	15,000	39,000	12,000	10.0 x 10 ⁶
5050-H	32 25,000	21,000	9	46	17,000	47,000	13,000	10.0 x 106
5050-H		24,000	8	53	18,000	52,000	13,000	10.0 x 10 ⁶
5050-H	36 30,000	26,000	7	58	19,000	56,000	14,000	10.0 x 106
5050-H	38 32,000	29,000	6	63	20,000	59,000	14,000	10.0 x 106
Alclad 5050-0	21,000	8,000	24	_	15,000	_	-	10.0 x 10
Alclad 5050-H	32 25,000	21,000	9	_	17,000	_	_	10.0 x 10
Alclad 5050-H	34 28,000	24,000	8	_	18,000	_	_	10.0 x 106
Alclad 5050-H	36 30,000	26,000	7	_	19,000	_	-	10.0 x 10
Alclad 5050-H	38 32,000	29,000	6	_	20,000			10.0 x 10
5052-0	28,000	13,000	25	47	18,000	61,000	16,000	10.2 x 106
5052-H	32 33,000	28,000	12	60	20,000	71,000	17,000	10.2 x 106
5052-H	34 38,000	31,000	10	68	21,000	78,000	18,000	10.2 x 106
5052-H	36 40,000	35,000	8	73	23,000	82,000	19,000	10.2 x 106
5052-H	38 42,000	37,000	7	77	24,000	86,000	20,000	10.2 x 106
6061-0	18,000	8,000	25	30	12,000	_	9,000	10.0 x 106
6061-T	35,000	21,000	22	65	24,000	73,000	14,000	10.0 x 106
6061-T	45,000	40,000	12	95	30,000	94,000	14,000	10.0 x 106
Alclad 6061-0	17,000	7,000	25	_	11,000	_		10.0 x 106
Alclad 6061-T		19,000	22		22,000	73,000	_	10.0 x 106
Alclad 6061-T		37,000	12		27,000	94,000		10.0 x 10 ⁶
7075-0	33,000	15,000	17	60	22,000	_	_	10.4 x 10
7075-T		73,000@	11	150	48,000	156,000	23,000	10.4 x 10
Alclad 7075-0	32,000	14,000	17	-	22,000	_	_	10.4 x 106
Alclad 7075-T	76,000	67,000	11	_	46,000	144,000	-	10.4 x 10

- ① Properties listed are for information only and are not guaranteed.
- 2 Ultimate bearing strength with edge distance 2.0 times rivet diameter.
- Based on 500,000,000 cycles of completely reversed stress using the R. R. Moore type of machine and specimen.
- 6 Average of tension and compression moduli. Compression modulus is about 2% greater than tension modulus.

TYPICAL PHYSICAL PROPERTIES

THERMAL CONDUCTIVITY, ELECTRICAL CONDUCTIVITY AND RESISTIVITY

Alloy	Temper	Condu	rmal ctivity C (77°F)	Electrical C at 20°C Perce Internationa Copper S	(68°F) ent of al Annealed	Electrical Resistivity at 20°C (68°F) Microhms— Ohms—		
		Units ①	Units ②	Volume	Weight	Centimeter	Mil, Foot	
1100	-0	.53	1540	59	194	2.9	17	
	-H18	.52	1510	57	187	3.0	18	
2014	-T4	.29	840	30	95	5.7	35	
	-T6	.37	1070	40	127	4.3	26	
2024	-0	.45	1310	50	160	3.4	21	
	-T3, T4, T36	.29	840	30	96	5.7	35	
3003	-0	.46	1340	50	163	3.4	21	
	-H12	.39	1130	42	137	4.1	25	
	-H14	.38	1100	41	134	4.2	25	
	-H18	.37	1070	40	130	4.3	26	
3004	All	.39	1130	42	137	4.1	25	
5005	All	.48	1390	52	172	3.3	20	
5050	All	.46	1340	50	165	3.4	21	
5052	All	.33	960	35	116	4.9	30	
6061	-0	.41	1190	45	148	3.8	23	
	-T4, T6	.37	1070	40	132	4.3	26	
7075	-T6	.29	840	30	95	5.7	35	

① CGS units = cal/cm/cm²/°C/sec.

English units = btu/in/ft²/°F/hr.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



CHASE ALUMINUM*

TYPICAL PHYSICAL PROPERTIES - SHEET AND PLATE DENSITY, MELTING RANGE AND THERMAL EXPANSION

A 11 o	Den	sity	Specific	Average Coefficient® of Thermal Expansion	Melting Range
Alloy	Lbs./Cu. in. Lbs./Cu. ft.		Gravity	68°F to 212°F	(Approx.)
1100	0.098	169	2.71	13.1	1190-1215
2014	0.101	175	2.80	12.8	950-1180
2024	0.100	173	2.77	12.9	935-1180
3003	0.099	170	2.73	12.9	1190-1210
3004	0.098	170	2.72	13.3	1165-1205
5005	0.098	169	2.70	13.2	1170-1205
5050	0.097	168	2.69	13.2	1160-1205
5052	0.097	167	2.68	13.2	1100-1200
6061	0.098	169	2.70	13.1	1080-1200
7075	0.101	175	2.80	13.1	890-1180

① Coefficient to be multiplied by 10^{-6} . Example $13.2 \times 10^{-6} = 0.0000132$.

APPROXIMATE RADII FOR 90° COLD BENDS ①

(In terms of thickness)

				Alloy	and Te	emper					Sheet Thickness (T)-Inches					
1100	3003	3004	5005	5050	5052	5086	6061	Alclad 2014	2024	7075	.016	.032	.064	.125	.187	.250
0	0	_	0	0		_	_	_	_	-	0	0	0	0	0	0
H-12 H-14	H-12	0	H-12	H-22 —	0	*0	0	0	0	_	0	0 _	0 _	0 _	0-1T -	0-1T —
	H-14	H-32	H-14	H-32	H-32	_	-	_	_	-	0	0	0	0-1T	0-1T	$\frac{1}{2}$ - $1\frac{1}{2}$ T
H-16	_	H-34	_	H-34	H-34	-	-	-	-	0	0	0	0-1T	$\frac{1}{2}$ - $1\frac{1}{2}$ T	1-2T	1½-3T
_	H-16	-	H-16	H-36	_	*H-32	T-4	-	-	-	0-1T	0-1T	$\frac{1}{2} - 1\frac{1}{2}T$	1-2T	1½-3T	2-4T
H-18	-	H-36	_	_	H-36	-	T-6	-	_	-	0-1T	$\frac{1}{2} - 1\frac{1}{2}T$	1-2T	1½-3T	2-4T	2-4T
-	H-18	H-38	H-18	H-38	H-38	_	-	-	_	-	$\frac{1}{2}$ - $1\frac{1}{2}$ T	1-2T	1½-3T	2-4T	3-5T	4-6T
	-	-	-	-	-	*H-36	-	T-3	-	-	1-2T	1½-3T	2-4T	3-5T	4-6T	4-6T
	_	_	_	-		_	_	T-4	_	_	_		_	_		
-	-	-	_	-	_	_	_	_	T-3	_	1½-3T	2-4T	3-5 T	4-6T	4-6T	5-7T
		_	_	_	_	_	_	T-6	T-36	T-6	2-4T	3-5T	3-5T	4-6T	5-7T	6-107

These radii represent average values for forming on conventional equipment with tools of good design and condition. The minimum permissible radii are subject to several variables and can only be reliably determined by actual forming under the specific manufacturing conditions. Alclad 2024 and Alclad 7075 permits slightly smaller radii than Bare 2024 and 7075.

^{*}Source - Kaiser Aluminum & Chemical Sales, Inc.



ALUMINUM TUBE

ALLOY 3003-0 - GENERAL PURPOSE-SEAMLESS

In 50-foot Coils



Packed 10 Coils to the Carton

General Purpose Seamless Aluminum Tube in soft temper flares readily, either manually or mechanically, and uncoils easily for cutting or straightening. Each length of tube is air pressure tested under water and offers high pressure capacity.

O.D. in	Wall Thickness	Nominal Coil Weight	O.D. in	Wall Thickness	Nominal Coil Weight
Inches	Inches	Lbs.	Inches	Inches	Lbs.
1/8	.025	.46	7/16	.035	2.63
3/16	.028	.83	1/2	.035	3.03
1/4	.032	1.30	1/2	.049	4.14
5/16	.035	1.81	5/8	.035	3.84
3/8	.035	2.22	5/8	.049	5.25
3/8	.049	2.98	3/4	.049	6.41

Chase General Purpose Seamless Aluminum Tube in 50-foot coils is also available from mill stocks in Alloys 1100, 5050, and 5052.

ALUMINUM EXTRUDED TUBE

ALLOY 6063-T5 Sharp Corners

In 21-foot, 1 inch Lengths

SQUARE

		Weight				Weight	
	Wall	Lbs. per	Lbs. per		Wall	Lbs. per	Lbs. per
O. D.	Thickness	Lin. Ft.	Length	O.D.	Thickness	Lin. Ft.	Length
Inches	Inches	(Approx.)	(Approx.)	Inches	Inches	(Approx.)	(Approx.)
5/8 x 5/8	.062	.168	3.542	1 3/4 x 1 3/4	.125	.974	20.535
$3/4 \times 3/4$.125	.374	7.885	2 x 2	.125	1.124	23.698
1 x 1	.125	.524	11.048	2 1/2 x 2 1/2	.125	1.412	29.770
1 1/4 x 1 1/4	.062	.354	7.463	3 x 3	.125	1.706	35.968
1 1/4 x 1 1/4	.125	.674	14.210	4 x 4	.125	2.294	48.365
1 1/2 x 1 1/2	.125	.824	17.373				
			RECTA	NGULAR			
1/2 x 1	.125	.374	7.885	$1 \ 3/4 \times 3$.125	1.350	28.462
$3/4 \times 1 1/2$.125	.600	12.650	$1 \ 3/4 \ x \ 3 \ 1/2$.125	1.500	31.625
$1 \times 1 \cdot 1/2$.125	.674	14.210	$1 \ 3/4 \times 4$.125	1.650	34.787
1 x 2	.125	.824	17.373	1 3/4 x 4 1/2	.125	1.800	37.950
1 1/4 x 2 1/2	.125	1.050	22.137	$1 \ 3/4 \ x \ 5$.125	1.950	41.112
$1 1/2 \times 2$.125	.974	20.535	2 x 3	.125	1.426	30.065
1 1/2 x 2 1/2	.125	1.134	23.908	2 x 4	.125	1.726	36.390
1 3/4 x 2 1/4	.125	1.118	23.571	2 x 5	.125	2.025	42.694

ALUMINUM 61.



ROUND ALUMINUM TUBE

ALLOY 3003-H14 In 12-foot Standard Lengths

O.D. Inches	Wall Thickness Stubs Gauge	Decimal Equiv.	Weight Lbs. per Lin. Ft. (Approx.)	O.D. Inches	Wall Thickness Stubs Gauge	Decimal Equiv.	Weight Lbs. per Lin. Ft. (Approx.)
1/4	24	.022	.0185	7/8	16	.065	.194
-/ -	20	.035	.0278	1	20	.035	.125
3/8	24	.022	.0287		18	.049	.172
07 0	22	.028	.0359		16	.065	.224
	20	.035	.0439	1 1/4	20	.035	.157
1/2	22	.028	.0488		18	.049	.217
-/ -	20	.035	.060	1 1/2	20	.035	.189
	18	.049	.082		18	.049	.263
	16	.065	.104		16	.065	.344
5/8	22	.028	.062	1 3/4	20	.035	.222
0, 0	20	.035	.076		16	.065	.404
	18	.049	.104	2	20	.035	.254
	16	.065	.134		18	.049	.353
3/4	20	.035	.092		16	.065	.464
3/ 1	18	.049	.127	2 1/2	18	.049	.443
	16	.065	.164	2 1/2	16	.065	.580
7/8	20	.035	.109	3	16	.065	.700
		ALLOY	5052-0 In 12-	foot Stand	ard Lengths		
0 (4 0	20			1 3/4	20	.035	.0906
3/16	20	.035	.0186	3/4	18	.035	.1225
1/4	20	.035	.0265	1	20		.1205
5/16	20	.035	.0343	1	18	.035 .049	.1666
3/8	20	.035	.0421	1 1/4	20		.157
1 (0	18	.049	.0568	1 1/4	18	.035 .049	.217
1/2	20	.035	.0578	1 1/2	18	.049	.2548
- /-	18	.049	.0794	1 3/4	18	.049	.3018
5/8	20 18	.035 .049	.0735 .1009	2	18	.049	.3461
		ALLOY	6061-T6 In 12	-foot Rand	om Lengths		
3/16	20	.035	.020	3/4	17	.058	.148
1/4	20	.035	.028		16	.065	.164
5/16	20	.035	.036	- (-	14	.083	.204
- /-	18	.049	.048	7/8	18	.049	.149
3/8	20	.035	.044		17	.058	.175
	18	.049	.059	1	16	.065	.194
	17	.058	.068	1	20	.035	.125
	16	.065	.074		18	.049	.172
	20	.035	.052	1	17	.058	.202
7/16		.049	.070		16	.065	.224
	18			1	14	.083	.281
	22	.028	.049				
7/16 1/2	22 20	.028 .035	.060	1 1/8	20	.035	.141
	22 20 18	.028 .035 .049	.060 .082		17	.058	.228
	22 20	.028 .035	.060	1 1/8	17 18	.058 .049	.228 .217
	22 20 18	.028 .035 .049	.060 .082 .095 .104		17 18 17	.058 .049 .058	.228 .217 .256
	22 20 18 17	.028 .035 .049 .058	.060 .082 .095		17 18 17 16	.058 .049 .058 .065	.228 .217 .256 .284
1/2	22 20 18 17 16	.028 .035 .049 .058 .065	.060 .082 .095 .104	1 1/4	17 18 17 16 14	.058 .049 .058 .065 .083	.228 .217 .256 .284 .357
	22 20 18 17 16 20	.028 .035 .049 .058 .065	.060 .082 .095 .104 .076		17 18 17 16	.058 .049 .058 .065	.228 .217 .256 .284 .357 .282
1/2	22 20 18 17 16 20 18	.028 .035 .049 .058 .065 .035	.060 .082 .095 .104 .076 .104	1 1/4	17 18 17 16 14	.058 .049 .058 .065 .083	.228 .217 .256 .284 .357



Woight

ROUND ALUMINUM TUBE

ALLOY 6061-T6 In 12-foot Random Lengths
Continued

	Wall Thickness		Weight Lbs. per		Wall Thickness		Weight Lbs. per
O.D.	Stubs	Decimal	Lin. Ft.	O.D.	Stubs	Decimal	Lin. Ft.
Inches	Gauge	Equiv.	(Approx.)	Inches	Gauge	Equiv.	(Approx.)
1 1/2	17	.058	.309	2	14	.083	.590
,	16	.065	.344		1/8	.125	.866
	14	.083	.434		1/4	.250	1.630
	1/8	.125	.640	2 1/4	18	.049	.398
	1/4	.250	1.155		16	.065	.520
1 5/8	20	.035	.206		14	.083	.660
2 0, 0	17	.058	.336	2 1/2	16	.065	.580
1 3/4	17	.058	.363	3	16	.065	.700
2	18	.049	.353		1/8	.125	1.328
-	17	.058	.416		1/4	.250	2.540
	16	.065	.464				

ROUND ALUMINUM PIPE

ALLOY 6061-T6

SCHEDULE 40

Sizes under 1/2" - 12-foot Lengths

Other Sizes: 20-foot Lengths

				Weight
Pipe			Wall	Lbs. per
Size	O.D.	I.D.	Thickness	Lin. Ft.
Inches	Inches	Inches	Inches	(Approx.)
1/8	.405	.269	.068	.085
1/4	.540	.364	.088	.147
3/8	.675	.493	.091	.196
1/2	.840	.622	.109	.294
3/4	1.050	.824	.113	.390
1	1.315	1.049	.133	.581
1 1/4	1.660	1.380	.140	.786
1 1/2	1.900	1.610	.145	.940
2	2,375	2.067	.154	1.264
2 1/2	2.875	2.469	.203	2.004
3	3.500	3.068	.216	2.621
3 1/2	4.000	3.548	.226	3.151
4	4.500	4.026	.237	3.733
5	5.563	5.047	.258	5.057
		ALLOY 6063-T6	SCHEDULE 40	
	Sizes under 1/2"	- 12-foot Lengths	Other Sizes: 20-foot Lengths	
1/4	.540	.364	.088	.147
3/8	.675	.493	.091	.196
1/2	.840	.622	.109	.294
3/4	1.050	.824	.113	.391
1	1.315	1.049	.133	.581
1 1/4	1.660	1.380	.140	.786
1 1/2	1.900	1.610	.145	.940
2	2.375	2.067	.154	1.264
3	3.500	3.068	.216	2.621
31/2	4.000	3.548	.226	3.151
4	4.500	4.026	.237	3.733



CHASE ALUMINUM EXTRUDED TUBE**

MECHANICAL PROPERTY LIMITS®

	loy Femper	Wall Thickness® Inches	Area Square Inches	Strengt Minin		Elongation in 2 Inches or 4D [®] Percent	
		incirco		Ultimate Yield		Minimum	
			1100				
1100-0		A11	All	15,000@		25	
1100 F		All	All				
			1060				
1060-0		All	All	9,500			
1060-H112		All	All	10,000			
			2014				
2014-0 10		All	All	30,000@	18,000 @	12	
		Up thru 0.499	All	50,000	30,000	12	
2014-T4		0.500 and over	All	55,000	35,000	12	
2014-T42	Heat treated	Up thru 0.499	All	50,000	29,000	12	
	by the user	0.500 and over	All	55,000	29,000	12	
		0.125-0.499	All All	60,000 64,000	53,000 58,000	7	
2014-T6		0.500-0.749 0.750 and over	Up thru 25	68,000	60,000	7	
		0.750 and over	Over 25 thru 32	1	58,000	6	
2014-T62	Heat treated		All	60,000	53,000	7	
	and aged by	0.125-0.749 0.750 and over	Over 25 thru 32	60,000	53,000	6	
	the user	0.750 and over	Over 25 thru 52	00,000	00,000		
			2024				
2024-0 @		All	All	35,000 €	19,000@	12	
		Up thru 0.499	All	60,000	40,000	10	
2024-T4		0.500-1.499	All	65,000	46,000	10	
2021-11		1.500 and over	Up thru 25	70,000	48,000	10	
0004 5040	TT-at tweated	1.500 and over Up thru 1.500	Over 25 thru 32 Up thru 25	68,000 57,000	46,000 38,000	10	
2024-T42	Heat treated by the user	1.500 and over	Over 25 thru 32	57,000	38,000	6	
	by the user	1.000 and 07 C1	3003	101,000			
3003-0		All	All	19,000@		25	
3003-0 3003-H112		0.050 and over	All	14,500			
3003-H112	•	All	All				
		A	lclad 3003 .		1		
Alclad 300	3-0	All	All	13,000			
Alclad 300		0.050 and over	All	13,500			
			3004		1		
3004-0		All	All	23,000 †			
200-7-0			5154	1,			
5154-0		All	All	30,000			
0104-0		*****	5254	30,000			
5254-0		All	All	30,000			
3234-U		AII		100,000			
			5454	01 000+	10.000	4.4	
5454-0		Up thru 5.000	All	31,000*	12,000	14	
5454-H112		Up thru 5.000	All	31,000*	12,000	12	
5454-H311		Up thru 5.000	All	31,000	16,000		

For all numbered footnotes see following page. *Maximum 41,000 psi. †Maximum 29,000 psi.

^{**}Source - The Aluminum Association.

CHASE ALUMINUM EXTRUDED TUBE**

MECHANICAL PROPERTY LIMITS®

Alloy and Temper	Wall Thickness®	Area Square Inches	Strengt Minin		Elongation in 2 Inches or 4D® Percent
and Temper Inches			Ultimate Yield		Minimum
		5456			
5456-0	All	All	42,000*		16
5456-H112	All	All	42,000		12
		6061			
6061-0 ®	All	All	22,000 ④	16,000@	16
6061-T4	All	All	26,000	16,000	16
6061-T6	All	All	38,000	35,000	10
6061-T62	All	All	35,000	26,000 🛈	10
		6062			
6062-0®	All	All	22,000@	16,000 ④	16
6062-T4	All	All	26,000	16,000	16
6062-T6	All	All	38,000	35,000	10
6062-T62	All	All	35,000	26,000 👽	10
		6063			
6063-09	All	All	19,000 ④		18
20.22 TA	Up thru 0.500	All	19,000	10,000	14
6063-T4®	0.501-1.000	All	18,000	9,000	14
6063-T42®	Up thru 0.500	All	17,000	9,000	12
0003-1420	0.501-1.000	All	16,000	8,000	12
6063-T5	Up thru 0.500	All	22,000	16,000	8
0000 10	0.501-1.000	All	21,000	15,000	8
6063-T6	Up thru 0.124	All	30,000 30,000	25,000 25,000	10
6063-F	0.125-1.000 All	All		25,000	10
6063-F	All				
		6066	100,000	10.0000	5
6066-0 ®	All	All	28,000 ④	18,000 ④	
6066-T4	All	All	40,000	25,000	14
6066-T6	All	All	50,000	45,000	8
		7001			
7001-0®	All	All	42,000③	26,000 @	10
	Up thru 0.249	All	89,000	82,000	5
7001-T6	0.250-0.749	All	92,000	84,000	5
	0.750-2.999	All	90,000	84,000	5
		7075			
7075-0®	All	All	40,000@	24,000@	10
7075-T6	Up thru 0.249	All	78,000	70,000	7
1010-10	0.250-2.999	All	80,000	72,000	7

1 Specimens tested parallel to direction of extrusion.

- ® Round tube 2 inches or less in outside diameter and square tube 1 1/2 inches or less on a side are tested in full section unless the limitations of the testing machine preclude the use of such a specimen. For round tube over 2 inches in diameter, for square tube over 1 1/2 inches on a side, for all sizes of tube other than round or square, or in those cases when a full section specimen cannot be used, a cut-out specimen is used.
- 3 D represents diameter of cut-out specimen.
- 1 Maximum. So specified to insure complete annealing.
- 3 Mechanical properties not specified or guaranteed.
- Proper aging (precipitation heat treatment) of 6063-T4 extruded tube will result in -T6 temper and properties.
- Proper aging (precipitation heat treatment) of 6063-T42 extruded tube will result in -T5 temper and properties.
- Annealed (-0 temper) tube shall upon heat treatment and aging be capable of developing the mechanical properties applicable to -T6 temper tube.
- Annealed (-0 temper) tube shall upon heat treatment be capable of developing the mechanical properties applicable to -T4 temper tube.
- Mannealed (-0 temper) tube shall upon heat treatment be capable of developing the mechanical properties applicable to -T42 temper tube.
- 1 Yield strength not to exceed 80 percent of the tensile strength.

CHASE ALUMINUM EXTRUDED TUBE*

STANDARD TOLERANCES - DIAMETER - ROUND TUBE

		Tolerance@	-Inches Plus and Minus	3	
Specified Outside or Inside Diameter ①	Allowable Deviation Diameter (state of the blank of the b	n Specified	Allowable Deviation of Point from Specific (Ovalne)	ed Diameter ①	
	Difference between 1/2 (AA + BB) and specified diameter		Difference between AA and specified diameter		
	Col. 2		Col. 3		
Col. 1	Alloys 5083, 5086, 5456	Other Alloys	Alloys 5083, 5086, 5456	Other Alloys	
0.500 - 0.999 1.000 - 1.999 2.000 - 3.999 4.000 - 5.999 6.000 - 7.999	.015 .018 .023 .038	.010 .012 .015 .025	.030 .038 .045 .075	.020 .025 .030 .050	
8.000- 9.999 10.000-11.999 12.000-13.999 14.000-15.999	.068 .083 .098	.045 .055 .065	.150 .188 .225 .263	.100 .125 .150	
16.000-17.999	.128	.085	.300	.200	

STANDARD TOLERANCES - WIDTH & DEPTH - SQUARE, RECTANGULAR, HEXAGONAL, OCTAGONAL TUBE

		Tolerance ®	-Inches Plus	s and M	inus
	Allowable Deviation Depth at Con Specified Width	Allowable Deviation of Width or Depth Not at Corners from Specified Width or Depth ®			
Specified Width or Depth® Inches			A+		A+ A
	Difference be and specifie or dep	Difference between AA and specified width, depth, or distance across flats			
	Square, Rect	angular	Square, H gonal, Octa		Rectangular
	Col.	2	Col. 3		
Col. 1	Alloys 5083, 5086, 5456	Other Alloys	Alloys 5083, 5086, 5456	Other Alloys	Col. 4
0.500 - 0.749 0.750 - 0.999 1.000 - 1.999 2.000 - 3.999 4.000 - 4.999 5.000 - 5.999 6.000 - 6.999 7.000 - 7.999 8.000 - 8.999 9.000 - 9.999 10.000 - 10.999	.018 .021 .027 .038 .053 .068 .083 .098 .113 .128	.012 .014 .018 .025 .035 .045 .055 .065 .075 .085	.030 .030 .038 .053 .068 .083 .098 .108 .123 .143	.020 .020 .025 .035 .045 .055 .065 .075 .085 .095	The tolerance for the width is the value in the previous column for a dimension equal to the depth, and conversely, but inno case is the tolerance less than at the corners. Example: The width tolerance of a 1x3 inch alloy 6062 rectangular tube is ±0.025 inch and the depth tolers.

For all numbered footnotes see page 72, this section. *Source - The Aluminum Association.



CHASE ALUMINUM EXTRUDED TUBE STANDARD TOLERANCES - WALL THICKNESS - ROUND TUBE

				Tole	Tolerance (2) - Inches Plus and Minus	ches Plus	s and Minus		
Specified Wall Thick- ness® Inches		Diffe	Allowable Deviation of Mean Wall Thickness® from Specified Wall Thickness A B B B B B B B B B B B B	ation of Decified V	Specified Wall Thickness A B B B A B B A B B A B B	kness®	from		Allowable Deviation of Wall Thickness at Any Point from Mean Wall Thickness® (Eccentricity)
			0	utside Di	Outside Diameter—Inches	S)
	Under 1.250	250	1.250-2.999	66	3.000-4.999	666	5.000 and over	over	and mean wall thickness
	Col. 2	6	Col. 3		Col. 4		Col. 5		Col. 6
Col. 1	Alloys 5083, 5086, 5456	Other	Alloys 5083, 5086, 5456	Other	Alloys 5083, 5086, 5456	Other Alloys	Alloys 5083, 5086, 5456	Other Alloys	All Alloys
Under 0.047 0.047-0.061 0.062-0.077 0.078-0.124	.009 .011 .012	.006 .007 .008		800.	.012 .014 .015	.008	.015	.010	Plus and minus 10% of
0.125-0.249	.014	.009	.014	.009	.020	.013	.030	.020	mean wall
0.375-0.499	:	:	.023	.015	.032	.021	.053	.035	thickness
0.750-0.999					.053	.035	.083	.055	max -0.000 min +0.010
1.500-2.000	: :				000.		.113	.075	
2.001-2.499	:	:				:	.128	.085	
2.500-2.999		•					.143	501.	+0.120
3 500-4.000								(1115)	

^{*}Source - The Aluminum Association.

CHASE ALUMINUM EXTRUDED TUBE STANDARD TOLERANCES - WALL THICKNESS - OTHER THAN ROUND TUBE

			Tolerance	Tolerance (3 - Inches Plus and Minus	lus and Minus	
	All	owable Deviat iness from Spe	Allowable Deviation of Mean® Wall Thickness from Specified Wall Thickness	all ness	Allowable Deviati at Any Point: Thickness®	Allowable Deviation of Wall Thickness at Any Point from Mean Wall Thickness® (Eccentricity)
Specified Wall Thickness®		▼				T.
Inches	Diff	erence between specified	Difference between $1/2\ (\mathrm{AA} + \mathrm{BB})$ and specified wall thickness	ınd	A' Difference between AA	A' Difference between AA and mean wall thickness
			Circu	mscribing Circl	Circumscribing Circle Diameter - Inches	
	Under 5,000	000	5,000 and over	over	Under 5.000	5,000 and over
	Col. 2		Col. 3	3	Col. 4	Col. 5
Col. 1	Alloys 5083, 5086, 5456	Other Alloys	Alloys 5083, 5086, 5456	Other Alloys	All	All Alloys
Under 0.047 0.047-0.061	.008	.005	.012	.008	.005	Plus and minus
0.125-0.124 0.125-0.249 0.250-0.374	.012	.008	.030	.020	.025	10% of mean
0.375-0.499	.021	.014	.045	.030	.030	thickness
0.750-0.999	.053	.035	.090	.050	.050	max ±0.060 min ±0.010
1.500-2.000		:	.105	.070		

For all numbered footnotes, see page 72, this section.

^{*}Source - The Aluminum Association.



CHASE ALUMINUM EXTRUDED TUBE

STANDARD TOLERANCES LENGTH

	7	Colerance-	-Inches	Plus excep	t as noted			
	Al	lowable De	eviation	from Speci	fied Lengt	h		
	Strai	ght			Coile	d		
		Sp	ecified	Length-Fe	et			
Up through 12	Over 12 through 30	Over 30 through 50	Over 50	100 101 250 50 and through through an less 249 499 over				
1/8 1/8 1/8 3/16	1/4 1/4 5/16	3/8 3/8 3/8 7/16	1 1 1	+5%, -0% +5%, -0%	±10% ±10%	±15% ±15%	±20% ±20%	
	through 12 1/8 1/8	Up through 12 through 30	Allowable De Straight Sp. Up	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	

CORNER RADII

SQUARENESS OF CUT ENDS

	Tolerance-Inches
	Allowable Deviation from Specified Radius
Specified	
Radius Inches	
	Difference between radius A and specified radius
Sharp corners	+ 1/64
Under 0.188	<u>+</u> 1/64
0.188 and over	<u>+</u> 10%

Allowable deviation from square: 1 degree.

STRAIGHTNESS

	Tolerance	® 9 -Inches
		Deviation from raight
Specified		
Outside		-1
Diameter	14	3
or Width	0	•
Inches		
inches	In Each Foot	In Total Length
	of Length 10	of Piece
0.500-5.999	.010	.010 x Length, ft
6,000 and over	.020	.020 x Length, ft

FLATNESS (Flat Surfaces)

	Tolerand	ce-Inches
Specified Wall Thickness	Maximum Allov	vable Deviation D
	Widths up thru 1 in. or any 1 in. Increment of Wider Surfaces	Widths Over 1 in.
Under 0.188	.006	.006xW (Inches)
0.188 and over	.004	.004xW (Inches)

ANGULARITY

Allowable deviation from specified angle: ±2°. 3.000 and over

TWIST Tolerance (8) - Degrees Allowable Deviation from Straight Specified Width Inches Y (max) in degrees In Each Foot In Total Length of Piece of Length 49 1xL, ft Under 1.500 1 1xL, ft: 5° max 1/2 1.500-2.999 LxL, ft: 3° max 1/4

For all numbered footnotes, see page 72, this section

*Source - The Aluminum Association.



CHASE ALUMINUM DRAWN TUBE**

Alloy	Wall	Strengt Minim		Elongation in 2 Percent I	
and Temper	Thickness Inches	Ultimate	Yield	Full-Section Specimen®	Cut-Out Specimen (
		110		specimens	Speciment
	A 11		1 1		
1100-0 6	A11	15,500®		• •	
1100-H12	All	14,000			
1100-H14	All	16,000			
1100-H16	All	19,000			
1100-H18	All	22,000			
1100-F®	A11				
		106			
1060-0	A11	9,500	2,500@		
1060-H12	0.010-0.500	10,000	4,000®		
1060-H14	Under 0.500	12,000	10,000®		
1060-H18	Under 0.500	16,000	13,000®		
		201	14		
2014-07	A11	32,000®	16,000®		
02100	0.018-0.024	54,000	30,000	10	
	0.025-0.049	54,000	30,000	12	10
2014-T4	0.050-0.259	54,000	30,000	14	10
	0.260-0.500	54,000	30,000	16	12
			55,000	7	
	0.018-0.024	65,000	,	7	6
2014-T6	0.025-0.049	65,000	55,000	8	7
00-H16 00-H18 00-F® 060-0 060-H12 00-H18 014-0® 014-T4 00 014-T6 00 00 00 00 00 00 00 00 00 00 00 00 00	0.050-0.259	65,000	55,000	9	8
	0.260-0.500	65,000	55,000	9	0
		202			
2024-0 ⑦	All	32,000®	15,000®		
	0.018-0.024	64,000	42,000	10	
0004 770	0.025-0.049	64,000	42,000	12	10
2024-T3	0.050-0.259	64,000	42,000	14	10
	0.260-0.500	64,000	42,000	16	12
	0.018-0.024	64,000	40,000	10	
	0.025-0.049	64,000	40,000	12	10
treated by the	0.050-0.259	64,000	40,000	14	10
user.®	0.260-0.500	64,000	40,000	16	12
	0,200-0,000	300			
2002 0@	All	19,000®	1		
	All	17,000		• • •	
					1
	All	20,000			
	All	24,000		• •	
3003-H18	All	27,000		• •	
3003-F®	All			• •	• •
			1 3003		
Alclad 3003-0	0.010 and over	19,000®			
Alclad 3003-H14	Under 0.500	19,000			
Alclad 3003-H18	Under 0.500	26,000			
		30	04		
3004-0	0.018-0.450	23,000*			
3004-H34	0.018-0.450	32,000			
3004-H38	0.018-0.450	38,000			
2004-1120	0.010-0.100	50			
F0F0 0 C	A 33		1		
5050-0®	All	24,000®			
5050-H32	All	22,000			
5050-H34	All	25,000		• •	
5050-H36	All	27,000			
5050-H38	All	29,000			
	A11				

For all numbered footnotes, see page 72, this section. *Maximum 29,000 psi.

^{**}Source - The Aluminum Association.





CHASE ALUMINUM DRAWN TUBE*

MECHANICAL PROPERTY LIMITS®

Alloy	Wall	Strengt Mini		Elongation in 2 Percent M	
and Temper	Thickness			Full-Section	Cut-Out
and remper	Inches	Ultimate	Yield	Specimen®	Specimen @
		505	52		
5052-0®	All	35,000⑤			
5052-H32	All	31,000			
5052-H34	All	34,000			
5052-H36	All	37,000			
5052-H38	All	39,000			
5052-F®	All				
		565	52		
5652-0®	All	35,000®			
5652-H32	All	31,000			
5652-H34	All	34,000			
5652-H36	All	37,000			
5652-H38	All	39,000			::
5652-F®	All			::	
0002-1 @		515			
5154-0 ⑥	0.010-0.450	30,000	11,000		
5154-U®	0.010-0.450	39,000	29,000		
5154-H38	0.010-0.450	45,000	34,000		
5104-030	0.010-0.230				
5054.00	1 0 010 0 450 1	525			
5254-0®	0.010-0.450	30,000	11,000		
5254-H34	0.010-0.450	39,000	29,000	• •	
5254-H38	0.010-0.250	45,000	34,000	• •	
		606		1 15	1.5
6061-0 😉	All	22,000®	14,000③	15	15
	0.025-0.049	30,000	16,000	16	14
6061-T4	0.050-0.259	30,000	16,000	18	16
	0.260-0.500	30,000	16,000	20	18
	0.025-0.049	42,000	35,000	10	8
6061-T6	0.050-0.259	42,000	35,000	12	10
	0.260-0.500	42,000	35,000	14	12
		600	62		
6062-0 10	All	22,000®	14,000③	15	15
	0.025-0.049	30,000	16,000	16	14
6062-T4	0.050-0.259	30,000	16,000	18	16
	0.260-0.500	30,000	16,000	20	18
	0.025-0.049	42,000	35,000	10	8
6062-T6	0.050-0.259	42,000	35,000	12	10
	0.260-0.500	42,000	35,000	14	12
		60	63		
6063-0ூ	All	19,000®			
	0.025-0.049	22,000	10,000	16	14
6063-T4	0.050-0.259	22,000	10,000	18	16
	0.260-0.500	22,000	10,000	20	18
	0.025-0.049	33,000	28,000	12	8
6063-T6	0.050-0.259	33,000	28,000	14	10
	0.260-0.500	33,000	28,000	16	12
6063-T83	All	33,000	30,000	5	
6063-T831	All	28,000	25,000	5	
6063-T832	All	38,000	35,000	5	

For all numbered footnotes, see page 72, this section.

*Source - The Aluminum Association.

CHASE ALUMINUM DRAWN TUBE*

MECHANICAL PROPERTY LIMITS®

Alloy	Wall	Strengt Mini		Elongation in 2 Percent M	
and Temper	Thickness Inches	Ultimate	Yield	Full-Section Specimen®	Cut-Out Specimen®
		606	36		
6066-0 🙉	All	28,000®	18,000®	16	16
6066-T4	All	40,000	25,000	14	12
6066- T 6	Up thru 0.050 0.051 and over	50,000 50,000	45,000 45,000	8 10	8

Footnotes for Pages 70 and 71, this Section, and Table above.

- ① Specimens tested parallel to the direction of drawing.
- 2 D represents diameter of cut-out specimen.
- Round tube 2 inches or less in outside diameter and square tube 1 1/2 inches or less on
 a side are tested in full-section unless the limitations of the testing machine preclude
 the use of such a specimen.
- To round tube over 2 inches in diameter, for square tube over 1 1/2 inches on a side, for all sizes of tube other than round or square, or in those cases when a full-section specimen cannot be used, a cut-out specimen is used.
- (5) Maximum. So specified to insure complete annealing.
- ® In this alloy tube other than round is produced only in the -F and -0 tempers. Properties for the -F temper are not specified or guaranteed.
- Annealed (-0 temper) tube shall upon heat treatment be capable of developing the mechanical properties applicable to -T4 temper tube.
- Material heat treated from any temper by the user should attain the mechanical properties applicable to this temper.
- (9) Yield strength determinations are not made or guaranteed unless specifically requested.
- Annealed (-0 temper) tube shall upon heat treatment and aging be capable of developing the mechanical properties applicable to -T6 temper tube.

FOOTNOTES FOR PAGES, 66-69, this Section:

- ① When outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other-than-round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.
- When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
- Mean diameter is the average of two diameter measurements taken at right angles to
 each other at any point along the length.
- Not applicable in the annealed (-0) temper or if wall thickness is less than 2 1/2 percent
 of the outside diameter or equivalent round diameter. The equivalent round diameter is
 the diameter of a circle having a circumference equal to the perimeter of the tube.
- The mean wall thickness of round tube is the average of two measurements taken opposite each other. The mean wall thickness of other-than-round tube is the average of two measurements taken opposite each other at approximate center line of tube and perpendicular to the longitudinal axis of the cross section.
- When dimensions specified are outside and inside, rather than wall thickness itself, allowable deviation at any point (eccentricity) applies to mean wall thickness.
- The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the tube.
- (a) Not applicable in the annealed (-0) temper.
- For all sizes of other-than-round tube, tolerance is applicable when weight of tube on flat surface minimizes deviation.
- @ These tolerances also apply to lengths shorter than one foot.
- *Source The Aluminum Association.



CHASE ALUMINUM DRAWN TUBE

STANDARD TOLERANCES - DIAMETER - ROUND TUBE*

	Tolerance ② -	-Inches Plus and Minus			
	Allowable Deviation of Mean Diameter ® from Specified Diameter (Size)	Point from Specifie	owable Deviation of Diameter at any Point from Specified Diameter (Ovalness)		
Specified Outside or Inside Diameter®		A+ 03-A	A- 0 - A		
	Difference between	Difference between A			
	1/2 (AA + BB) and specified diameter	Non-Heat-Treated Tube®	Heat-Treated Tube®		
Col. 1	Col. 2	Col. 3	Col. 4		
Under 0.501 0.501- 1.000 1.001- 2.000	.003 .004 .005	.003 .004 .005	.006 .008 .010		
2.001- 3.000 3.001- 5.000 5.001- 6.000	.006 .008 .010	.006 .008 .010	.012 .016 .020		
6.001 - 8.000 8.001 - 10.000 10.001 - 12.000	.015 .020 .025	.015 .020 .025	.030 .040 .050		

① When outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other-than-round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.

When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.

Mean diameter is the average of two diameter measurements taken at right angles to
 each other at any point along the length.

Not applicable to annealed (-0 temper) tube, coiled tube, or tube having a wall thickness
 less than 0.020 inch or less than 2 1/2 per cent of the outside diameter or equivalent
 round diameter. The equivalent round diameter is the diameter of a circle having a cir cumference equal to the perimeter of the tube.

§ For the -T8 tempers of 6063 the tolerances in Column 3 apply.

Example: The width tolerance of 1x3 inch rectangular tube is plus and minus 0.008 inch
 and the depth tolerance is plus and minus 0.012 inch.

*Source - The Aluminum Association.



CHASE ALUMINUM DRAWN TUBE'

Square, Rectangular, Hexagonal and Octagonal

STANDARD TOLERANCES - WIDTH AND DEPTH

	Tolerance 🥸	Inches Plus and M	Minus
	Allowable Deviation of Width or Depth at Corners from Specified Width or Depth	Not at Corn	ation of Width or Depth ers from Specified n or Depth®
Specified Width or Depth® Inches		A - A - A	À
	Difference between AA and specified width or depth		ween AA and specified distance across flats
	Square, Rectangular	Square, Hexa- gonal, Octagonal	Rectangular
Col. 1	Col. 2	Col. 3	Col. 4
Under 0.501 0.501- 1.000 1.001- 2.000	.003 .004 .005	.006 .008 .010	The tolerance for the width is the value in
2.001 - 3.000 3.001 - 5.000 5.001 - 6.000	.006 .008 .010	.012 .016 .020	Col. 3 for a dimension equal to the depth, and conversely, but in no case is the tolerance
6.001 - 8.000 8.001 - 10.000 10.001 - 12.000	.015 .020 .025	.030 .040 .050	less than at the corners. ©

① When outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other-than-round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.

When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and

minimum dimensions permissible under the tolerance.

Not applicable to annealed (-0 temper) tube, coiled tube, or tube having a wall thickness less than 0.020 inch or less than 2 1/2 per cent of the outside diameter or equivalent round diameter. The equivalent round diameter is the diameter of a circle having a circumference equal to the perimeter of the tube.

⊕ Example: The width tolerance of 1x3 inch rectangular tube is plus and minus 0.008 inch

and the depth tolerance is plus and minus 0.012 inch.

Oval, Elliptical and Streamline Tube STANDARD TOLERANCES - DIAMETER

		Tolerance-	Inches (1) (2)	
Equivalent	Leng	th of	Leng	th of
Round	Major A	xis, Inch	Minor A	xis, Inch
Diameter®	(Figure	No. 1)	(Figure	No. 2)
Inches	Difference	between AA	Difference between	
	and specified length and spe		and specif	ied length
Col. 1	Col	. 2	Col	. 3
Under 2.501	+.040	025	+.025	015
2.501 - 4.250	+.050	035	+.035	025
4.251 - 6.000	+.070	050	+.055	040
6.001 - 8.000	+.100	085	+.080	060
8.001-10.000	+.160	140	+.115	085

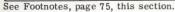




Figure No. 1



*Source - The Aluminum Association.



CHASE ALUMINUM DRAWN TUBE

Round and Other-than-Round Tube

STANDARD TOLERANCES - WALL THICKNESS

	Tolerance ①	2 -Inches Plus and	d Minus
	Allowable Deviation of	Allowable Deviat	ion of Wall Thickness
	Mean Wall Thickness	at any Point from	Specified Wall Thickness
	from Specified Wall Thickness	(Ec	centricity)
Specified		Round, Non-	Round, Heat-Treatable
Thick-		Heat-Treatable	Alloys and Other than
ness®		Alloys®	Round, All Alloys
Inches	Difference between	Difference be-	Difference between AA
	1/2 (AA+BB) and	tween AA and	and specified
	specified wall thickness	specified wall	wall thickness
		thickness	
	(Figure No. 1)	(Figure No. 2)	(Figure No. 3)
Col. 1	Col. 2	Col. 3	Col. 4
0.010-0.035	.002	.002	
0.036-0.049	.003	.003	
0.050-0.083	.004	.004	Plus and minus 10%
0.084-0.120	.005	.006	of specified wall
0.121-0.203	.006	.008	thickness,
0.204-0.300	.008	.012	min. ±0.003
0.301-0.375	.015	.020	
0.376-0.500	.020	.030	



Figure No. 1



Figure No. 2



Figure No. 3

STANDARD TOLERANCE - CORNER RADII

Specified Radius Inches	Tolerance—Inches⊕ Allowable Deviation from Specified Radius (Figure No. 4) Difference between radius A and
inches	specified radius
Sharp corners	+ 1/64
Under 0.188	<u>+</u> 1/64
0.188 and over	± 10%



- 1 When outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other-than-round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three.
- When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance.
- (9) The mean wall thickness of round tube is the average of two measurements taken opposite each other. The mean wall thickness of other-than-round tube is the average of two measurements taken opposite each other at approximate center line of tube and perpendicular to the longitudinal axis of the cross section.
- When dimensions specified are outside and inside, rather than wall thickness itself, allowable deviation at any point (eccentricity) is plus and minus 10 percent of the mean wall thickness but not less than + 0.003 inch.
- Equivalent round diameter is the diameter of the circle having a circumference equal to the perimeter of the tube.
- For coiled tube, values in Column 4 apply.

^{*}Source - The Aluminum Association.

CHASE ALUMINUM DRAWN TUBE*

STANDARD TOLERANCES - STRAIGHTNESS

	Tolerand	e-Inches 1 2
Specified Outside Diameter or Width Inches	Allowable Devi	lation from Straight
	Г	(max)
	In Each Foot of Length®	In Total Length of Piece
Under 0.375 0.375-5.999 6.000 and over	.500 .010 .020	.500③ x Length, ft .010 x Length, ft .020 x Length, ft

STANDARD TOLERANCES - TWIST

	То	lerance—Degrees ②
Specified Width Inches	Allowabl	e Deviation from Straight
	In Each Foot of Length®	(max) in degrees In Total Length of Piece
Under 1.500 1.500-2.999	1 1/2	1 x Length, ft 1/2 x Length, ft: 5° max
3.000 and over	1/4	1/4 x Length, ft: 3° max

STANDARD LENGTH TOLERANCES - STRAIGHT LENGTHS

	Tolerance-Inches				
Specified Outside	Allo	wable Deviation fr	om Specified Lengt	h	
Diameter	Specified Length-Feet				
or Width Inches	Up through 12	Over 12 through 30	Over 30 through 50	Over 50	
Under 0.250 0.250-1.249 1.250-2.999 3.000-7.999 8.000 and over	1/4 1/8 1/8 3/16 1/4	3/8 1/4 1/4 5/16 3/8	1/2 3/8 3/8 7/16 1/2	1 1 1 1	

See Footnotes, Page 77, this section.

^{*}Source - The Aluminum Association.



CHASE ALUMINUM DRAWN TUBE'

STANDARD LENGTH TOLERANCES - COILS

Specified	Tolerance—Inches Plus except as noted Allowable Deviation from Specified Length Specified Length—Feet				
Inches					
Under 0.250 0.250-1.249 1.250-2.999 3.000-7.999	+5%, -0% +5%, -0%	±10% ±10%	±15% ±15%	±20% ±20%	
8.000 and over					

STANDARD TOLERANCES - FLATNESS (Flat Surfaces)

Other than Round Tube

Other than Round Tube						
	Tolerance ③ −Inches					
Specified Width or Depth Inches	Allowable Deviation from Flat					
	Maximum allowable distance Y					
Under 0.501	.003					
0.501- 1.000	.004					
1.001 - 2.000	.005					
2.001- 3.000	.006					
3.001 - 5.000	.008					
5.001 - 6.000	.010					
	.015					
6.001 - 8.000	.010					
6.001 - 8.000 8.001 - 10.000	.020					

STANDARD TOLERANCE - SQUARENESS OF CUT ENDS

Allowable deviation from square: 1 degree.

STANDARD TOLERANCE - ANGULARITY

Allowable deviation from specified angle: +2 degrees.

- ① For round tube under 0.375 inch diameter and for all sizes of other-than-round tube, tolerance is applicable when weight of tube on flat surface minimizes deviation.
- 3 Not applicable to annealed (-0 temper) tube.
- 3 Not applicable to length under 10 feet.
- Not applicable to annealed (-0 temper) tube, coiled tube, or tube having a wall thickness
 less than 0.020 inch or less than 2 1/2% of the equivalent round diameter. Equivalent
 round diameter is the diameter of a circle having a circumference equal to the perimeter
 of the tube.
- These tolerances also apply to lengths shorter than one foot.

^{*}Source - The Aluminum Association.



CHASE ALUMINUM PIPE*

MECHANICAL PROPERTY LIMITS

Alloy and Temper	Pipe Size	Stren psi Mini	Elongation in 2 Inches or 4D®	
	Inches	Ultimate	Yield	Percent Minimum
3003-H18	Under 1	27,000		
3003-H112	1 and over	14,500		• •
5154-H38	Under 1	45,000	34,000	
5154-H112	1 and over	30,000	11,000	• •
5254-H38	Under 1	45,000	34,000	
5254-H112	1 and over	30,000	11,000	• •
5454-0	1 and over	31,000	12,000	14
5454-H112	1 and over	31,000	12,000	12
5456-0	All	42,000		16
5456-H112	A11	42,000		12
00.01 TO	Under 1	42,000	35,000	12
6061-T6	1 and over	38,000	35,000	10
20.20 ma	Under 1	42,000	35,000	12
6062-T6	1 and over	38,000	35,000	10
6063-T5	A11	22,000		10
6063-T6	All	30,000	25,000	8
6066-T6	All	50,000	45,000	8

① Specimens tested parallel to the direction of working.

STANDARD TOLERANCES - STRAIGHTNESS

	Toleranc	e ④ −Inches
	Allowable Devia	ntion from Straight
Pipe Size Inches		(max)
	D	
	In Each Foot of Length®	In Total Length of Piece
Under 6 6-12	.010 .020	.010 x Length, ft

For footnotes, see Page 79, this section.

³ D represents diameter of cut-out specimen.

^{*}Source - The Aluminum Association.





CHASE ALUMINUM PIPE*

STANDARD TOLERANCES - OUTSIDE DIAMETER

	Tolerand	ce-Inches
	Allowable Deviation of Mean® Diameter from Nominal Diameter®	Allowable Deviation of Diameter at any Point from Nominal Diameter ®
Pipe Size Inches	A	
	Difference Between 1/2 (AA + BB) and Nominal Diameter	Difference Between AA and Nominal Diameter
	Schedule 5 and 10	Schedule 20 and Greater
Under 2 2-4 4 1/2-7 8-12	+.015031 +.031031 +.062031 +.093031	+.015031 +1% -1% +1% -1% +1% -1%

STANDARD TOLERANCES

WALL THICKNESS

	Tolerance
Schedule Number	Allowable Deviation of Wall Thickness at any Point from Nominal Wall Thickness
5 and 10 20 and greater	±12 1/2%, ±.012 in. min -12 1/2% (3)

LENGTH, PLAIN END PIPE

Specified	Tolerance					
Length	Inches Plus					
Feet	Allowable Deviation from Specified Length					
20 and under	1/4					
Over 20 thru 40	1/2					

WEIGHT

	Tolerance		
Schedule Number	Allowable Deviation from Theoretical Weight		
5 and 10 20 and greater	® +8%®		

- ① Nominal diameter and wall thickness are those listed in table on pages 80 and 81.
- Mean diameter is the average of any two diameter measurements taken at right angles to
 each other at any point along the length.
- 3 Maximum wall thickness is controlled by weight tolerance.
- (1) When weight of pipe on flat surface minimizes deviation.
- § For schedule 5 and 10, only diameter, wall thickness and length tolerances apply.
- @ Minimum weight is controlled by tolerances for outside diameter and wall thickness.
- These tolerances also apply to lengths shorter than one foot.

^{*}Source - The Aluminum Association.



CHASE ALUMINUM PIPE*

STANDARD TOLERANCES

DIAMETERS, WALL THICKNESSES, WEIGHTS

Nominal Pipe Size	Schedule Num-	Out	side Dia Inches	meter	Inside Diameter Inches	Inches			Fo Por	ht Per oot unds
Inches	ber ①	Nom		Max 24		Nom		Max ②		Max@3
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col.10	Col. 11
1/0	40	0.405	0.374	0.420	0.269		0.060		0.085	0.091
1/8	80	0.405	0.374	0.420	0.215		0.083		0.109	0.117
1/4	40	0.540	0.509	0.555	0.364		0.077		0.147	0.159
1/ 1	80	0.540	0.509	0.555	0.302		0.104		0.185	0.200
3/8	40	0.675	0.644	0.690	0.493		0.080		0.196	0.212
3/8	80	0.675	0.644	0.690	0.423		0.110	0.077	0.256	0.216
	5	0.840	0.809	0.855	0.710		0.053	0.077	0.180	
1 (0	10	0.840	0.809	0.855	0.674		0.095	0.093	0.293	0.317
1/2	40 80	0.840	0.809	0.855 0.855	0.546		0.129		0.233	0.406
	160	0.840	0.809	0.855	0.466		0.164		0.451	0.487
	5	1.050	1.019	1.065	0.920		0.053	0.077	0.237	
	10	1.050	1.019	1.065	0.884		0.071	0.095	0.297	
3/4	40	1.050	1.019	1.065	0.824		0.099		0.391	0.422
3/4	80	1.050	1.019	1.065	0.742		0.135		0.510	0.550
	160	1.050	1.019	1.065	0.614		0.191		0.670	0.724
	5	1.315	1.284	1.330	1.185		0.053	0.077	0.300	
	10	1.315	1.284	1.330	1.097		0.095	0.123	0.486	
1	40	1.315	1.284	1.330	1.049	0.133	0.116		0.581	0.627
1	80	1.315	1.284	1.330	0.957	0.179	0.157		0.751	0.811
	160	1.315	1.284	1.330	0.815	0.250	0.219		0.984	1.062
	5	1.660	1.629	1.675	1.530		0.053	0.077	0.383	
	10	1.660	1.629	1.675	1.442		0.095	0.123	0.625	
1 1/4	40	1.660	1.629	1.675	1.380		0.122		0.786	0.849
	80	1.660	1.629	1.675	1.278		0.167		1.037	1.120
	160	1.660	1.629	1.675	1.160		0.219		1.302	1.406
	5	1.900	1.869	1.915	1.770		0.053	0.077	0.441	
	10	1.900	1.869	1.915	1.682	0.109	0.095	0.123	0.721	1.015
$1 \ 1/2$	40	1.900	1.869	1.916	1.610		0.127		1.256	1.356
	80	1.900	1.869	1.916 1.916	1.500		0.246		1.681	1.815
	160	1.900	1.869	2.406	2.245		0.053	0.077	0.555	
	10	2.375	2.344	2.406	2.157		0.095	0.123	0.913	
2	40	2.375	2.351	2.399	2.067		0.135		1.264	1.365
4	80	2.375	2.351	2.399	1.939		0.191		1.737	1.876
	160	2.375	2.351	2.399	1.689	1	0.300		2.575	2.781
	5	2.875	2.844	2.906	2.709	0.083	0.071	0.095	0.856	
	10	2.875	2.844	2.906	2.635	0.120		0.135	1.221	
2 1/2	40	2.875	2.846	2.904	2.469	0.203			2.004	2.164
	80	2.875	2.846	2.904	2.323	0.276	0.242		2.650	2.862
	160	2.875	2.846	2.904	2.125		0.328		3.464	3.741
	5	3.500	3.469	3.531	3.334		0.071	0.095	1.048	
	10	3.500	3.469	3.531	3.260		0.105	0.135	1.498	
3	40	3.500	3.465	3.535	3.068		0.189		2.621	2.830
	80	3.500	3.465	3.535	2.900		0.262		3.547	3.830
	160	3.500	3.465	3.535	2.626	0.437	0.382		4.945	5.341

¹ American Standards Association schedule number.

② Based on standard tolerances for pipe on page 79.

Based on nominal dimensions, plain ends, and a density of 0.098 lb per cu in., the density of 6061, 6062, 6063 and 6066 alloys. For alloy 3003 multiply by 1.01; for 5154, 5254 and 5456 by 0.98; for 5454 by 0.99.

[•] For schedules 5 and 10 these values apply to mean outside diameters.

^{*}Source - The Aluminum Association.

^{80.} ALUMINUM

CHASE ALUMINUM PIPE*

STANDARD TOLERANCES

DIAMETERS, WALL THICKNESSES, WEIGHTS (CONTINUED)

	DIAME	IEKS,	WALL	IHICKIN	E22E2, 1	VEIGI	715 (.ONTI	NOED)	
Nominal Pipe Size	Schedule Num-	Ou	tside Dia Inches		Inside Diameter	Wall Thickness Inches			F	ht Per oot unds
	ber ①	Man	1/:	13/	Inches	37	3.52.	Morra		
Inches		Nom		Max ② ④	Nom	Nom		Max ②		Max 2
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col.10	Col. 11
	5	4.000	3.969	4.031	3.834	0.083	0.071	0.095	1.201	
	10	4.000	3.969	4.031	3.760	0.120	0.105	0.135	1.720	
3 1/2	40	4.000	3.960	4.040	3.548	0.226	0.198		3.151	3.403
	80	4.000	3.960	4.040	3.364	0.318	0.278		4.326	4.672
	5	4.500	4.469	4.531	4.334	0.083	0.071	0.095	1.354	
	10	4.500	4.469	4.531	4.260	0.120	0.105	0.135	1.942	
4	40	4.500	4.455	4.545	4.026	0.237	0.207		3.733	4.031
	80	4.500	4.455	4.545	3.826	0.337	0.295		5.183	5.598
	120	4.500	4.455	4.545	3.626	0.437	0.382		6.560	7.084
	160	4.500	4.455	4.545	3.438	0.531	0.465		7.786	8.409
	5	5.563	5.532	5.625	5.345	0.109	0.095	0.123	2.196	
	10	5.563	5.532	5.625	5.299	0.134	0.117	0.151	2.688	
5	40	5.563	5.507	5.619	5.047	0.258	0.226		5.057	5.461
	80	5.563	5.507	5.619	4.813	0.375	0.328		7.188	7.763
	120	5.563	5.507	5.619	4.563	0.500	0.438		9.353	10.10
	160	5.563	5.507	5.619	4.313	0.625	0.547		11.400	12.31
	5	6.625	6.594	6.687	6.407	0.109	0.095	0.123	2.624	
	10	6.625	6.594	6.687	6.361	0.134	0.117	0.151	3.213	
6	40	6.625	6.559	6.691	6.065	0.280	0.245		6.564	7.089
U	80	6.625	6.559	6.691	5.761	0.432	0.378		9.884	10.67
	120	6.625	6.559	6.691	5.501	0.562	0.492		12.59	13.60
	160	6.625	6.559	6.691	5.189	0.718	0.628		15.67	16.92
	5	8.625	8.594	8.718	8.407	0.109	0.025	0.123	3.429	
	10	8.625	8.594	8.718	8.329	0.109	0.130	0.123	4.635	
	20	8.625	8.539	8.711	8.125	0.250	0.219	0.100	7.735	8.354
	30	8.625	8.539	8.711	8.071	0.230	0.219		8.543	9.226
	40	8.625	8.539	8.711	7.981	0.322	0.242		9.878	10.67
	40	0.023	0.009	0.111	1.901					10.07
8	60	8.625	8.539	8.711	7.813	0.406	0.355		12.33	13.32
	80	8.625	8.539	8.711	7.625	0.500	0.438		15.01	16.21
	100	8.625	8.539	8.711	7.439	0.593	0.519		17.60	19.00
	120	8.625	8.539	8.711	7.189	0.718	0.628		20.97	22.65
	140	8.625	8.539	8.711	7.001	0.812	0.711		23.44	25.31
	160	8.625	8.539	8.711	6.813	0.906	0.793		25.84	27.90
	5	10.750	10.719	10.843	10.482	0.134	0.117	0.151	5.256	
	10	10.750	10.719	10.843	10.420	0.165	0.144	0.186	6.453	
	20	10.750	10.642	10.858	10.250	0.250	0.219		9.698	10.47
	30	10.750	10.642	10.858	10.136	0.307	0.269		11.84	12.79
10	40	10.750	10.642	10,858	10.020	0.365	0.319		14.00	15.12
		10.750	10.642	10.858	9.750	0.500	0.438		18.93	20.45
	80	10.750	10.642	10.858	9.564	0.593	0.519		22.25	24.03
	100	10.750	10.642	10.858	9.314	0.393	0.628		26.61	28.74
	5	12.750	12.719	12.843	12.420	0.165	0.020	0.186	7.672	
	10	12.750	12.719	12.843	12.420	0.180	0.144	0.186	8.359	
	20	12.750	12.719	12.843	12.390	0.180	0.158		11.55	12.47
12	30									
12		12.750	12.622	12.878	12.090	0.330	0.289		15.14	16.35
	40	12.750	12.622	12.878	11.938	0.406	0.355		18.52	20.00
	60	12.750	12.622	12.878	11.750	0.500	0.437		22.63	24.44
	80	12.750	12.622	12.878	11.376	0.687	0.601		30.62	33.07

① American Standards Association schedule number.

³ Based on standard tolerances for pipe on page 79.

Based on nominal dimensions, plain ends, and a density of 0.098 lb per cu in., the density
 of 6061, 6062, 6063 and 6066 alloys. For alloy 3003 multiply by 1.01; for 5154, 5254 and
 5456 by 0.98; for 5454 by 0.99.

[●] For schedules 5 and 10 these values apply to mean outside diameters.

^{*}Source - The Aluminum Association.





ALUMINUM COLD-HEADING WIRE



Chase Aluminum Cold Heading or Rivet Wire is a high-grade material that differs from round drawn wire in several ways and has its own characteristics. It is made to different tolerance limits for better handling in cold headers and is carefully checked for seams. It is specially tested for shear strength after heat treatment.





ALUMINUM COLD HEADING WIRE

IN COILS

X = Stock Sizes

			X = Stock	Sizes				
	Weight* Lbs. per	Lineal Feet	Alloy					
Diameter	Lin. Ft.	Per Lb.	1100	1100	1180	1180	2017	2024
Inches	(Approx.)	(Approx.)	H-14	H-16	H-14	H-26	H-13	-0
.033	.0010	1000.0				X		
.044	.0018	555.6				X		
.052	.0025	400.0				X		
.061	.0034	294.1				X		
.070	.0045	222.2				X		
.080	.0060	166.7				X		
.090	.0076	131.6				X		
.092	.0078	128.2						X
. 102	.0096	103.8				X		
.108	.0108	92.6						X
.110	.0112	89.3						X
.113	.0118	84.7						X
.114	.0120	83.3				X		
. 117	.0126	79.4	X		X			
.123	.0139	71.9	X				X	X
.125	.0144	69.4				X		
.128	.0151	66.2				X		
.131	.0158	63.3						X
.140	.0181	55.2	X		X			X
. 144	.0191	52.4				X		
.147	.0199	50.3						X
.154	.0219	45.7				X	X	X
.158	.0230	43.5						X
. 162	.0242	41.3				X		
. 165	.0251	39.8						X
.169	.0263	38.0					**	X
. 175	.0282	35.5					X	
. 181	.0302	33.1	X			**		
. 182	.0305	32.8				X	**	37
. 184	.0312	32.1	X				X	X
.203	.0380	26.3		X		**		
. 204	.0384	26.0				X		
. 212	.0414	24.2					**	X
.247	.0562	17.8	X				X	X
.250	.0576	17.4	X					
.268	.0662	15.1						X
.271	.0677	14.8						X
. 328	.0992	10.1						X
.330	.1004	10.0		X				
.376	.1303	7.7		X				

Continued

2017 - 1.03

2024 - 1.02

Many other sizes can be furnished promptly from mill stocks.

^{*}Weights given are for Alloys 1100 and 1180. To find weight of other alloys, multiply weight above by conversion factors as follows:



ALUMINUM COLD HEADING WIRE

IN COILS

Continued
X = Stock Sizes

	Weight*	Lineal			Alloy		
Diameter Inches	Lbs. per Lin. Ft. (Approx.)	Feet Per Lb. (Approx.)	2024 H-13	2117 H-15	5056 -0	5056 H-18	5056 H-32
.100	.0092	108.7				77	x
. 105	.0101	99.0				X	
.110	.0112	89.3	X				
.113	.0118	84.7	X			X	
.116	.0124	80.6			X		
. 117	.0126	79.4				X	
.118	.0128	78.1		X			
.123	.0139	71.9	X	X			X
.131	.0158	63.3	X				
.138	.0176	56.8			X		X
.140	.0181	55.2	X				X
.147	.0199	50.3	X				
.154	.0219	45.7	X	X			X
.158	.0230	43.5	X				X
.165	.0251	39.8	X				
.169	.0263	38.0	X				
.175	.0282	35.5		X			X
.181	.0302	33.1					X
.184	.0312	32.1	X	X	X		X
.198	.0361	27.7	X				
.212	.0414	24.2	X				
.234	.0505	19.8	X				
.247	.0562	17.8	X	X			X
.271	.0677	14.8	X				
.310	.0886	11.3	X				X
. 325	.0974	10.3					X
. 340	.1066	9.4	X				
. 372	.1276	7.8	X				

^{*}Weights given are for Alloys 1100 and 1180. To find weight of other alloys, multiply weight shown above by conversion factors as follows:

2024 - 1.02

2217 - 1.01

5056 - 0.974

FOR DATA ON WIRE-See Pages 9-22, this Section.

Many other sizes can be furnished promptly from mill stocks.



ALUMINUM SHAPES



Light in weight, yet in some alloys having the equivalent strength of steel, Aluminum Shapes are a modern answer to many design problems--both in architecture and engineering. Because of the oxide coating that forms upon exposure, aluminum is highly resistant to atmospheric corrosion. Aluminum shapes are easily cut, drilled or punched, and they can be welded.

In addition to the aluminum angles and channels carried in stock, we are in a position to promptly supply many other shapes such as "H" and "I" beams, tees, zees, etc. from mill stocks available to us, and special shapes.



ALUMINUM ANGLES

EQUAL LEGS

X = Stock Sizes

		Weight		20.20 775
Dimen-	Thick-	Lbs. per	6061-T6	6063-T5
sions	ness	Foot	25-foot	16-foot
Inches	Inches	(Approx.)	Lengths	Lengths
$1/2 \times 1/2$	x 1/16	.070		X
$1/2 \times 1/2$	x 1/8	.131		X
5/8 x 5/8	x 1/8	.168		X
3/4 x 3/4	- 1/10	.107		x
$3/4 \times 3/4$ $3/4 \times 3/4$.206	X	X
3/4 X 3/4	: X 1/0	.206	A	
1 x 1 x 1/		.145		X
1 x 1 x 1/	/8	.281	X	X
1 x 1 x 3/	/16	.408	X	X
1 x 1 x 1/	/4	.510	X	
1 1/4 x 1	1/4 x 1/8	.355	X	X
1 1/4 x 1	1/4 x 3/16	.519	X	X
$1 1/4 \times 1$	1/4 x 1/4	.660	X	
1 1/2 x 1	1/2 x 1/8	.431	X	X
$1 1/2 \times 1$	$1/2 \times 3/16$.632	X	X
1 1/2 x 1	$1/2 \times 1/4$.810	X	
1 3/4 x 1	3/4 x 1/8	.506		X
2 x 2 x 1/	/8	.581	X	X
2 x 2 x 3	/16	.860	X	X
2 x 2 x 1	/4	1.124	X	X
2 1/2 x 2	1/2 x 3/16	1.070	X	
2 1/2 x 2	$1/2 \times 1/4$	1.410	X	
3 x 3 x	1/4	1.680	X	
3 x 3 x 5	/16	2.080	X	
3 x 3 x 3/	/8	2.470	X	
4 x 4 x 1	/4	2.280	X	
		UNIFOLIAL IF	CC	

UNEQUAL LEGS

x x x x x x x x x

3/8 x 3/4 x 3/32	.116		
1/2 x 1 x 3/32	.158		
1/2 x 1 x 1/8	.206		
1/2 x 1 1/4 x 1/8	.244		
3/4 x 1 x 1/8	.244		
3/4 x 1 1/2 x 1/8	.319		
1 x 1 1/2 x 1/8	.356		
1 x 2 x 1/8	.431		
1 x 3 x 1/8	.581		
1 1/4 x 3 1/2 x 1/8	.694		
1 1/2 x 2 x 1/8	.510		
1 1/2 x 2 x 1/4	.950	X	
2 x 2 1/2 x 3/16	.960	X	
2 x 3 x 1/4	1.400	X	
3 x 4 x 3/8	2.920	X	

ANGLES ARE ALSO AVAILABLE WITH:

- (a) Rounded inside angle and rounded inside corners;
- (b) Rounded corners and rounded inside fillets.



ALUMINUM STANDARD STRUCTURAL CHANNELS

ALLOY 6061-T6

In 25-foot lengths

Size in Inches	Weight Lbs. per Lin. Ft. (Approx.)	Size in Inches	Weight Lbs. per Lin. Ft. (Approx.)
3 x .170	1.42	4 x .247	2.16
3 x .258	1.73	5 x .325	3.11
4 x .180	1.85	6 x .314	3.63

ALUMINUM CHANNELS

SHARP CORNERSa

ALLOY 6063-T5

In 16-foot lengths*

Base Inches	Legs Inches	Thick- ness Inches	Weight Lbs. per Lin. Ft. (Approx.)	Base Inches	Legs Inches	Thick- ness Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/2	3/8 x 3/8	1/8	.150	1 3/4	$1/2 \times 1/2$	1/8	.374
1/2	$1/2 \times 1/2$	3/32	.148	1 3/4	$3/4 \times 3/4$	1/8	.450
*5/8	5/8 x 5/8	1/16	.131	1 3/4	1 x 1	1/8	.524
5/8	$5/8 \times 5/8$	1/8	.244				
0, 0	0, 0 11 0, 0			2	$1/2 \times 1/2$	1/8	.413
3/4	3/8 x 3/8	1/8	.186	2	1 x 1	1/8	.563
3/4	$1/2 \times 1/2$	1/8	.224	2	2 x 2	1/8	.826
*3/4	$3/4 \times 3/4$	1/16	.155				
3/4	$3/4 \times 3/4$	1/8	.299	2 1/4	$7/8 \times 7/8$	1/8	.563
3/ 4	0/ 1 A 0/ 1	1/0	1200	2 1/2	$3/4 \times 3/4$	1/8	.563
1	$1/2 \times 1/2$	1/8	.262				
1	1 x 1	1/8	.413	3	$1/2 \times 1/2$	1/8	.563
1 1/4	$1/2 \times 1/2$	1/8	.299	3	1 x 1	1/8	.713
	1 1/4 x 1 1/4	1/8	.526	o o	1 11 1		
1 1/4	1 1/4 X 1 1/4	1/0	.520	4	1 1/2 x 1 1/2	1/8	1.013
11/2	$1/2 \times 1/2$	1/8	.336				
1 1/2	3/4 x 3/4	1/8	.413	5	2 x 2	3/16	1.940

^{*}Starred sizes also stocked in 12-foot lengths.

^aAluminum channels are also available with:

⁽a) Rounded inside angles, sharp corners

⁽b) Rounded inside angles, rounded inside corners

⁽c) Rounded angles, rounded corners

⁽d) Rounded angles, sharp corners

⁽e) Tapered legs.

GET THESE

ALUMINUM SPECIALTY ITEMS, TOO FROM

CHASE METALS SERVICE

Chase Metals Service Division service centers are in a position to supply a variety of aluminum specialties which, though not stocked by all Chase Metals Service Branches, are available to all Branches through stock transfer, or are available to any Chase Metals Service Division service center from mill stocks. We can usually give good delivery on any item listed here, and will be glad to quote price and delivery.

SHFFT & PLATE

Embossed Sheet Circles & Rings

Fin Stock

License Plate Stock

Type 1 Mobile Home Flat Sheet & Coil

Type 2 Mobile Home Coiled Sheet--Painted & Unpainted

Truck Trailer Panel Stock

Traffic and Street Sign Blanks

Industrial Foil

Architectural Sheet

Brazing Sheet

Porcelain Enameling Sheet

Tread Plate

Litho Sheet

ROD-BAR-WIRE

Flattened Wire--Coiled--Spooled--Straight Lengths--Shapes

EXTRUSIONS

Special Shapes

Gravel Stops & Accessories

Outside Corners

Inside Corners

Joint Covers

Coping Sections

Coping

Outside Corners

Inside Corners

Anchor & Gutter Bar

Anchor Bolt & Plate Assembly

Joint Cover

Thresholds

Fascia System

Head Sill Stop

Anchor

Inside Corner

Outside Corner

End Stop

Expander

Spacer

Joint Cover

Standard

Gravel Stop Fascia System

Starter

Filler

Soffit

Handrails

Window Sills

Sill Clips





CHASE ALUMINUM*

STRUCTURAL SHAPES-ROLLED OR EXTRUDED

MECHANICAL PROPERTY LIMITS®

Alloy Thickness®		Stre psi Mi	Elongation in 2 Inches or 4D® Percent		
Temper	inches	Ultimate	Yield	Minimum	
2014-T4	All	50,000	32,000	12	
2014-T6	All	60,000	53,000	7	
5454-0	Up thru 5.000®	31,000	12,000	14	
5454-H112	Up thru 5.000®	31,000	12,000	12	
5454-H311	Up thru 5.000®	31,000	16,000	8	
5456-0	Up thru 5.000®	42,000	19,000	16	
5456-H111	Up thru 5.000®	42,000	26,000	12	
5456-H112	Up thru 5.000®	42,000	19,000	12	
5456-H311	Up thru 5.000®	42,000	25,000	12	
5083-0	All	38,000	16,000	16	
5083-H112	All	40,000	24,000	12	
5086-H112	All	35,000	18,000	12	
6061-T4	All	26,000	16,000	16	
6061-T6	A11	38,000	35,000	10	
6061-T62	All	35,000 €	26,000€	10	
6062-T4	All	26,000	16,000	16	
6062-T6	All	38,000	35,000	10	
6066- T 4	All	40,000	25,000	14	
6066-T6	All	50,000	45,000	8	

- ① The thickness of the cross-section from which the tension test specimen is taken determines the applicable mechanical properties. For material 1 1/2 inches or less in thickness, when not tested in full section, the tension test specimen is taken from the center of the section; for material over 1 1/2 inches in thickness, the specimen is taken midway between the center and the surface. Specimens are taken parallel to the direction of extrusion or rolling.
- Tor material of such thickness that a standard test specimen cannot be taken, or for material thinner than 0.062 inch, the test for elongation is not required.
- 3 D represents specimen diameter.
- (1) The yield strength shall not be more than 80 percent of the ultimate strength.
- 3 Areas up thru 32 square inches.

STANDARD TOLERANCES - LENGTH

Specified Width or Depth, Whichever Greater Inches		Tolerance-	Inches Plus		
	Allowable Deviation from Specified Length				
		Specified L	ength-Feet		
	Up thru 12	Over 12 thru 30	Over 30 thru 50	Over 50	
<i>Under 3.000</i> 3.000-7.999 8.000 and over	1/8 3/16 1/4	1/4 5/16 3/8	3/8 7/16 1/2	1 1 1	

*Source - The Aluminum Association.

CHASE ALUMINUM*

STRUCTURAL SHAPES-ROLLED OR EXTRUDED

STANDARD TOLERANCES - CROSS-SECTIONAL DIMENSIONS

	Nominal	Tolerances① Inches or Percent of Nominal Dimension Allowable Deviation from Nominal Dimension		
Shapes	Dimensions	Alloys 5083, 5086, 5456	Other Alloys	
177	† Thickness	±4%, ±.015 min.	±2 1/2%, ±.010 min.	
d	b Flange Width	<u>+</u> 4%	±4%	
- -b→	d Depth	+3/32, -1/16	+3/32, -1/16	
	† Thickness	±4%, ±.015 min.	±2 1/2%, ±.010 min.	
d + H-Beams	b Flange Width	<u>±</u> 4%	±4%	
b	d Depth	±2 1/2%, ±1/16 min.	±2 1/2%, ±1/16 min.	
T WHITE	† Thickness	<u>+4</u> %, <u>+</u> .015 min.	±2 1/2%, ±.010 min.	
d + Channels	b Flange Width	<u>+4</u> %	±4%	
b	d Depth	+3/32, -1/16	+3/32, -1/16	
b	† Thickness	±4%, ±.015 min.	±2 1/2%, ±.010 min.	
Angles	b Flange Width	±2 1/2%, ±1/16 min.	±2 1/2%, ±1/16 min.	
b	† Thickness	±4%, ±.015 min.	±2 1/2%, ±.010 min.	
d t Tees	b Flange Width	<u>+4</u> %	<u>+</u> 4%	
	d Stem Height	±2 1/2%, ±1/16 min.	±2 1/2%, ±1/16 min.	
b	† Thickness	±4%, ±.015 min.	±2 1/2%, ±.010 min.	
d - t t Zees	b Flange Width	±2 1/2%, ±1/16 min.	±2 1/2%, ±1/16 min.	
-b-	d Depth	±2 1/2%, ±1/16 min.	±2 1/2%, ±1/16 min.	

① These tolerances do not apply to structural shapes produced by extrusion if width or depth is 8.000 inches or over.

STANDARD TOLERANCES - WEIGHT

Allowable deviation from nominal weight of a lot or shipment $\pm 2.1/2$ percent for sizes 3 inches and larger. (For sizes smaller than 3 inches, only cross-sectional dimension and length tolerances apply.)

^{*}Source - The Aluminum Association.



CHASE ALUMINUM*

STRUCTURAL SHAPES-ROLLED OR EXTRUDED

STANDARD TOLERANCES - SQUARENESS OF CUT ENDS Allowable deviation from square: 1 degree.

STANDARD TOLERANCES - STRAIGHTNESS

Length	Tolerance ① -Inches
Feet	Allowable Deviation from Straight
Up thru 5 Over 5	.125 Length, Ft x .025

STANDARD TOLERANCES - TWIST

	Tolerance-Degrees		
Specified Width or Depth, Whichever Greater Inches	Allowable Deviation from Straight (Figure No. 1) Y (max) in degrees		
	In Each Foot of Length®	In Total Length of Piece	
Under 1.500 1.500-2.999 3.000 and over	1 1/2 1/4	1 x Length, ft 1/2 x Length, ft: 5° max 1/4 x Length, ft: 3° max	

STANDARD TOLERANCES - ANGULARITY

Nominal	Tolerance
Leg, Web,	Degrees Plus and Minus
or Flange Thickness, Whichever Least Inches	Allowable Deviation from Specified Angle (Figure No. 2) Y (max) in degrees
Under 0.188	2
0.188-0.749	1 1/2
0.750 and over	1

STANDARD TOLERANCES - FLATNESS (Flat Surfaces)

	Tolerance, Inches
Surface Width Inches	(Figure No. 3) Maximum Allowable Deviation D
Up thru 1 Over 1 In any 1 in. of	.004 .004 x W (Inches)
width	.004



Figure No. 1



Figure No. 2



Figure No. 3

¹ When weight of shape on flat surface minimizes deviation.

These tolerances also apply to lengths shorter than one foot.

^{*}Source - The Aluminum Association.



The Centaur offers a new Multi-Metal Service! Its aim ... to give you the best in service, the finest quality in metals—all at competitive prices. For ALUMINUM, BRASS, COPPER, STAINLESS, call on your nearby Chase multi-metal stocks. Here, "One Call Gets All"—including technical advice.

BRASS & BRONZE

ROD

BAR

SHEET

STRIP

PLATE

TUBE

PIPE

WIRE

SHAPES



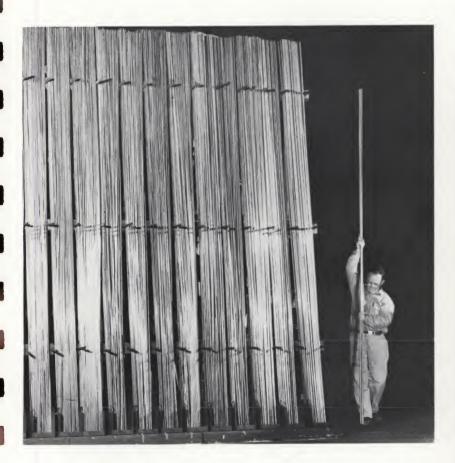
CHASE METALS SERVICE

BRASS & BRONZE INDEX

Copper Alloy Numbers are those assigned to each alloy by Copper & Brass Research Association, and adopted as Standard Identification by the Industry.

ROD & BAR	TUBE
Data	Data 69-81
Free-Cutting Brass, Copper Alloy No. 360 2-6	Antimonial Admiralty, Copper Alloy No. 444 63-64
Leaded Commercial Bronze, Copper Alloy No. 314 10-11	Cartridge Brass, 70%, Copper Alloy No. 260 54-59
Leaded Naval Brass, Copper Alloy No. 485 6-7	Commercial Bronze, 90%, Copper Alloy No. 220 61-62
Leaded Phosphor Bronze	Condenser Tube
(Grade B1), Copper Alloy No. 534 16-17	Cupro Nickel, 30%, Copper Alloy No. 715 64-65
Naval Brass, Copper Alloy No. 464 8-9	Heat Exchanger Tube 63-64
Phosphor Bronze, 5%	High-Leaded Brass, Copper Alloy No. 332 60-61
(Grade A), Copper Alloy No. 510 15,17	Inhibited Alum. Brass, Copper Alloy No. 687 64
Silnic Bronze, Copper Alloy No. 647 12,14 444 Bronze,	Low-Leaded Brass, Copper Alloy No. 330 58
Copper Alloy No. 544 13-14	Phosphorized Admiralty (Type D), Copper Alloy No. 445 63-64
SHEET, STRIP, PLATE	Red Brass, 85%, Copper Alloy No. 230 59
	Special Shape Tube 59,66
Data 49-52	Waveguide Tube 61
Cartridge Brass, 70%, Copper Alloy No. 260 24-33	PIPE
Copper Alloy No. 260 24-33 Commercial Bronze, 90%,	Red Brass, 85%,
Copper Alloy No. 260 24-33 Commercial Bronze, 90%, Copper Alloy No. 220 40-41	
Copper Alloy No. 260 24-33 Commercial Bronze, 90%, Copper Alloy No. 220 40-41 Embossed Sheet Metal 48	Red Brass, 85%, Copper Alloy No. 23067,68,76,77
Copper Alloy No. 260 24-33 Commercial Bronze, 90%, Copper Alloy No. 220 40-41	Red Brass, 85%, Copper Alloy No. 230 67,68,76,77 WIRE Data
Copper Alloy No. 260 24-33 Commercial Bronze, 90%, Copper Alloy No. 220 40-41 Embossed Sheet Metal 48 Gilding Metal, 95%, Copper Alloy No. 210 41-42 High Leaded Brass,	Red Brass, 85%, Copper Alloy No. 23067,68,76,77 WIRE Data
Copper Alloy No. 260 24-33 Commercial Bronze, 90%, Copper Alloy No. 220	Red Brass, 85%, Copper Alloy No. 230 67,68,76,77 WIRE Data
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230
Copper Alloy No. 260	Red Brass, 85%, Copper Alloy No. 230





BRASS & BRONZE ROD AND BAR



Chase Metals Service stocks brass and bronze rod and bar in many non-leaded and leaded alloys, with different properties to fulfill nearly every commercial requirement that confronts the fabricator. Additional alloys can be supplied on order.

All Chase rod and bar alloys are extruded and then cold drawn to finished dimensions. Because of this method of hot and cold working, they are of very uniform composition and structure, and can be held to close dimensional tolerances.

When Chase rod and bar are packed, all the chamfered ends are packed at one end of the case, and the end of the case is clearly marked, making handling of the rod unnecessary, where space is at a premium.

For further information about Chase rod and bar, write to your nearest Chase Metals Service Center for the following free catalog: "Chase Free-Cutting Brass, Bronze, Copper."



FREE-CUTTING BRASS ROD

COPPER ALLOY NO. 360

CHEMICAL COMPOSITION*

Copper, 61.5%

Zinc. 35.3%

Lead. 3.2%

The accepted standard for high speed screw machine work, Free-Cutting Brass Rod is the outstanding material whenever machinability is of primary importance. The machinability ratings generally assigned to copper-base alloys are, incidentally, based on a comparison with that of Free-Cutting Brass, which has a machinability rating of 100. Actual life of cutting tools is greater than for most other commercial metal. It provides precise dimensional control and optimum smoothness of machined surfaces.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering
Annealing Temperature	Butt Not Recommended

MECHANICAL PROPERTIES*

	1/4" Half Hard (25%)	1" Half Hard (20%)	2" Half Hard (15%
Tensile Strength, p.s.i.	68,000	58,000	55,000
Yield Strength, p.s.i.	52,000	45,000	44,000
Shear Strength, p.s.i.	38,000	34,000	32,000
Elongation, % in 2-in.	18	25	32
Rockwell Hardness	B80	B78	B75

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1630 Density, lbs., per cu. in. @ 68F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension)	Liquidus 1650 0.307 8.50 0.0000114 per °F. from 68 F. to 572 F. 67 Btu/sq. ft./ft./hr./°F @ 68 F. 39.9 Ohms (circ. mil./ft.) @ 68 F. 26 % IACS @ 68 F. 0.09 Btu./lb./°F. @ 68 F. 14.000.000 psi
Modulus of Elasticity (Tension)	14,000,000 psi
Modulus of Rigidity	5,300,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	72
A.S.T.M.	B16
A.M.S.	4610H
Federal	QQ-B-626b, Comp. 22 and 11 Half Hard
Military	MIL-C-895A

^{*}All Values nominal. Not to be used as specification requirements.



FREE-CUTTING BRASS ROD

COPPER ALLOY NO. 360

ROUND In 8 to 12-foot Lengths

Diameter		Weight		Diameter	
Stubs	Decimal	Lbs. per	Stubs	Decimal	Lbs. per
Gauge	Equivalent	Foot	Gauge	Equivalent	Foot
or Inches	Inches	(Approx.)	or Inches	Inches	(Approx.
No. 18	.049	.0074		.816	.195
No. 17	.058	.0106	27/32	.844	2.06
1/16	.0625	.0113	7/8	.875	2.22
No. 16	.065	.0115	29/32	.906	2.38
No. 15	.072	.0155	15/16	.938	2.54
5/64	.0781	.0177	31/32	.969	2.72
No. 14	.083	.0203	1	1.000	2.89
3/32	.0938	.0254	1 1/32	1.0312	3.08
No. 13	.095	.0260	1 1/16	1.0625	3.27
No. 13 7/64	.109	.0346	1 3/32	1.0938	3.47
1/8	.125	.0452	1 1/8	1.125	3.66
9/64	.141	.0572	1 5/32	1.156	3.86
No. 9	.148	.0639	1 3/16	1.188	4.08
5/32	.156	.0706	1 1/4	1.250	4.52
No. 8	.165	.0781	1 5/16	1.312	4.98
11/64	.172	.0855	1 3/8	1.375	5.47
3/16	.188	.102	1 7/16	1.438	5.93
13/64	.203	.119	1 1/2	1.500	6.51
7/32	.219	.138	1 9/16	1.562	7.06
15/64	.234	.159	1 5/8	1.625	7.64
1/4	.250	.181	1 11/16	1.688	8.24
17/64	.266	.204	1 3/4	1.750	8.86
9/32	.281	.229	1 13/16	1.812	9.51
19/64	.297	.255	1 7/8	1.875	10.2
5/16	.312	.283	1 15/16	1.938	10.9
21/64	.328	.312	2	2.000	11.6
$\frac{21}{04}$.344	.342	2 1/16	2.0625	12.3
23/64	.359	.374	2 1/8	2.125	13.1
3/8	.375	.407	2 3/16	2.188	13.8
25/64	.391	.441	2 1/4	2.250	14.6
			2 5/16	2.312	15.5
13/32	.406	.478	2 3/16	2.375	16.3
27/64	.4218	.515	2 7/16	2.437	17.2
7/16	.438	.554	2 1/16		18.1
29/64 15/32	.453 .469	.594 .636	2 1/2 2 5/8	2.500 2.625	19.9
	.4858	.715	2 3/4 2 7/8	2.750 2.875	21.9 23.9
1/2	.500	.723			26.0
17/32	.531	.817	3	3.000	
9/16	.562	.915	3 1/4	3.250	30.6
19/32	.594	1.02	3 1/2	3.500	35.4
5/8	.625	1.13	3 3/4	3.750	40.7
21/32	.656	1.25	4	4.000	46.3
11/16	.688	1.37	4 1/4	4.250	52.3
23/32	.719	1.49	4 1/2	4.500	58.6
3/4	.750	1.63	5	5.000	72.3
25/32	.781	1.77	5 1/4	5.250	79.7
13/16	.812	1.91	6	6.000	104.0

Sizes other than listed can be furnished from mill stocks.

BRASS & BRONZE 3.

FREE-CUTTING BRASS ROD

COPPER ALLOY NO. 360

HEXAGONAL
In 8 to 10-foot Lengths

Diameter		Weight	Dia	ameter	Weight
	Decimal	Lbs. per		Decimal	Lbs. per
	Equivalent	Lin. Ft.		Equivalent	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
1/8	.125	.0499	1	1.000	3.19
5/32	.156	.0779	1 1/32	1.032	3.39
3/16	.188	.112	1 1/16	1.0625	3.60
7/32	.219	.153	1 3/32	1.094	3.82
1/4	.250	.199	1 1/8	1.125	4.04
9/32	.281	.252	1 3/16	1.188	4.50
5/16	.312	.312	1 1/4	1.250	4.99
11/32	.344	.377	1 5/16	1.312	5.50
3/8	.375	.449	1 3/8	1.375	6.03
13/32	.406	.527	1 7/16	1.438	6.59
7/16	.438	.611	1 1/2	1.500	7.18
15/32	.469	.701	1 5/8	1.625	8.43
1/2	.500	.798	1 3/4	1.750	9.77
9/16	.562	1.01	1 13/16	1.812	10.5
5/8	.625	1.25	1 7/8	1.875	11.2
11/16	.688	1.51	1 15/16	1.938	12.0
23/32	.719	1.65	2	2.000	12.8
3/4	.750	1.80	2 1/4	2.250	16.2
25/32	.781	1.95	2 3/8	2.375	18.0
13/16	.812	2.11	2 1/2	2.500	19.9
27/32	.844	2.27	2 3/4	2.750	24.1
7/8	.875	2.44	2 7/8	2.875	26.4
29/32	.906	2.62	3	3.000	28.7
15/16	.938	2.80	3 1/2	3.500	39.1
31/32	.969	2.99			

FREE-CUTTING BRASS BAR

COPPER ALLOY NO. 360

SQUARE

In 8 to 12-foot Lengths

3/32	.0938	.0324	1 7/8	.875	2.82
1/8	.125	.0576	15/16	.938	3.24
5/32	.156	.0899	1	1.000	3.68
3/16	.188	.130	1 1/8	1.125	4.66
1/4	.250	.230	1 1/4	1.250	5.76
9/32	.281	.291	1 3/8	1.375	6.97
5/16	.312	.360	1 1/2	1.500	8.29
3/8	.375	.518	1 5/8	1.625	9.73
7/16	.438	.705	1 3/4	1.750	11.3
1/2	.500	.921	1 7/8	1.875	13.0
9/16	.562	1.17	1 15/16	1.938	13.8
5/8	.625	1.44	2	2.000	14.7
11/16	.688	1.74	2 1/4	2.250	18.7
3/4	.750	2.07	2 1/2	2.500	23.0
13/16	.812	2.43	3	3.000	33.2
	Sizes oth	ner than listed can	be furnished from	n mill stocks.	



FREE-CUTTING BRASS ROD

COPPER ALLOY NO. 360

HALF ROUND In Standard Mill Lengths

Diameter		Weight	Diamet	Weight	
Thickness Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)	Thickness Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)
3/32 1/8 5/32 3/16 1/4 5/16	3/16 1/4 5/16 3/8 1/2 5/8	.051 .091 .142 .204 .362	3/8 7/16 1/2 5/8 3/4	3/4 7/8 1 1 1/4 1 1/2	.815 1.11 1.45 2.26 3.25

HALF OVAL In Standard Mill Lengths

3/32	3/8	.096	1/4	3/4	.505
1/8	3/8	.136	1/4	7/8	.584
1/8	1/2	.167	1/4	1	.662
5/32 3/16 3/16	5/8 5/8 3/4	.260 .312 .378	5/16 1/2	1 1/4 2	1.13 2.90

FREE-CUTTING BRASS BAR

COPPER ALLOY NO. 360

RECTANGULAR--DRAWN--HALF HARD TEMPER

In Standard Mill Lengths

For lighter cross-sections, see Flat Cartridge Brass, 70% Strip, Brass & Bronze, Page 28.

Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
3/32	1/4	.0861	1/8	1 1/2	.688
3/32	3/8	.129	1/8	$1 \ 3/4$.803
3/32	1/2	.172	1/8	2	.918
3/32	5/8	.215	1/8	21/2	1.15
3/32	3/4	.258	1/8	3	1.38
3/32	1	.344	1/8	4	1.84
3/32	1 1/4	.430	3/16	1/4	.172
3/32	1 1/2	.516	3/16	3/8	.258
1/8	1/4	.115	3/16	1/2	.344
1/8	5/16	.143	3/16	5/8	.430
1/8	3/8	.172	3/16	3/4	.516
1/8	1/2	.230	3/16	7/8	.602
1/8	5/8	.287	3/16	1	.688
1/8	3/4	.344	3/16	1 1/4	.860
1/8	7/8	.402	3/16	$1 \ 1/2$	1.03
1/8	1	.459	3/16	1 3/4	1.20
1/8	1 1/8	.517	3/16	2	1.38
1/8	1 1/4	.574	3/16	2 1/2	1.72

Continued

Sizes other than listed can be furnished from mill stocks.

FREE-CUTTING BRASS BAR

COPPER ALLOY NO. 360

RECTANGULAR--DRAWN--HALF HARD TEMPER
In Standard Mill Lengths
(Continued)

		Weight Lbs. per	1		Weight Lbs. per
Thickness	Width	Lin. Ft.	Thickness	Width	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
3/16	3	2.07	3/8	1 3/4	2.41
3/16	3 1/2	2.41	3/8	2	2.75
3/16	4	2.75	3/8	2 1/2	3.44
1/4	5/16	.287	3/8	3	4.13
1/4	3/8	.344	3/8	4	5.51
1/4	1/2	.459	1/2	5/8	1.15
1/4	5/8	.574	1/2	3/4	1.38
1/4	3/4	.688	1/2	7/8	1.61
1/4	7/8	.803	1/2	1	1.84
1/4	1	.918	1/2	1 1/4	2.30
1/4	1 1/4	1.15	1/2	1 1/2	2.76
1/4	1 1/2	1.38	1/2	2	3.67
1/4	1 3/4	1.61	1/2	2 1/2	4.59
1/4	2	1.84	1/2	3	5.51
1/4	2 1/4	2.07	1/2	3 1/2	6.43
1/4	2 1/2	2.30	1/2	4	7.34
1/4	3	2.75	5/8	3/4	1.72
1/4	3 1/2	3.22	5/8	1	2.30
1/4	4	3.67	5/8	1 1/4	2.87
1/4	5	4.59	5/8	1 1/2	3.45
5/16	1/2	.574	5/8	2 1/2	5.84
5/16	5/8	.717	3/4	1	2.75
5/16	3/4	.861	3/4	1 1/4	3.45
5/16	1	1.15	3/4	1 1/2	4.14
5/16	1 1/4	1.44	3/4	2	5.52
5/16	1 1/2	1.72	3/4	2 1/2	6.89
5/16	2	2.30	3/4	3	8.25
3/8	1/2	.688	3/4	4	11.00
3/8	5/8	.861	1	1 1/2	5.41
3/8	3/4	1.03	1	2	7.34
3/8	7/8	1.20	1	3	11.02
3/8	1	1.38	1	4	14.7
3/8	1 1/4	1.72	1 1/2	3	16.5
3/8	1 1/2	2.07	1		

LEADED NAVAL BRASS ROD

COPPER ALLOY NO. 485

ROUND--FREE-CUTTING In Standard Mill Lengths

Diameter		Weight	I Di	ameter	Weight
Inches	Decimal Equivalent Inches	Lbs. per Lin. Ft. (Approx.)	Inches	Decimal Equivalent Inches	Lbs. per Lin. Ft. (Approx.)
7/32	.219	.140	1	1.000	2.87
1/4	.250	.179	1 1/8	1.125	3.63
5/16	.312	.280	1 3/16	1.188	4.04
3/8	.375	.403	1 1/4	1.250	4.48
7/16	.438	.548	1 3/8	1.375	5.42
1/2	.500	.716	1 1/2	1.500	6.45
9/16	.562	.907	1 3/4	1.750	8.77
5/8	.625	1.12	2	2.000	11.5
11/16	.688	1.37	3	3.000	25.8
3/4	.750	1.61	5	5.000	71.8
13/16	.812	1.89	6	6.000	103.9
7/8	875	2.19	1		



LEADED NAVAL BRASS ROD

COPPER ALLOY NO. 485

CHEMICAL COMPOSITION*

Copper, 60.5%

Zinc, 36.75%

Tin. 0.75%

Lead. 2%

Leaded Naval Brass combines all the good features of ordinary Naval Brass (strength, hardness and fair resistance to salt water corrosion), plus a considerably improved machinability. It is used extensively for marine hardware, forgings, screw machine products, valve stems and bushings.

FABRICATION PROPERTIES*

MECHANICAL PROPERTIES* (1" Rod, Hard (16%))

Tensile Strength, p.s.i.	75,000
Yield Strength, p.s.i.	56,000
Shear Strength, p.s.i.	4,000
Elongation, % in 2-in.	25
Rockwell Hardness	B80

PHYSICAL PROPERTIES*

 $\begin{array}{ll} \text{Melting Point, °F. Solidus} & \underline{1630} \\ \text{Density, lbs., per cu. in. @ } 68\overline{\text{F.}} \\ \text{Specific gravity} \\ \text{Coefficient of Thermal Expansion} \\ \text{Thermal Conductivity} \\ \text{Electrical Resistivity (Annealed)} \\ \text{Electrical Conductivity (Annealed)} \\ \text{Thermal Capacity (Specific Heat)} \\ \text{Modulus of Elasticity (Tension)} \\ \text{Modulus of Rigidity} \\ \end{array}$

0.0000118 67 Btu./sq. ft./ft./hr./°F @ 68 F. 39.9 Ohms (circ. m.l./ft.) @ 68 F. 26 % IACS @ 68 F. 0.09 Btu./lb. °F. @ 68F.

0.09 Btu./lb. °F. @ 68F. 15,000,000 psi

15,000,000 psi 5,600,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M.

B21, Alloy C

A.M.S.

QQ-B-637, Comp. 3

Federal Military

MIL-C-895A

^{*}All Values nominal. Not to be used as specification requirements.



NAVAL BRASS ROD

COPPER ALLOY NO. 464

CHEMICAL COMPOSITION*

Copper, 60.5%

Zinc. 38.75%

Tin, 0.75%

Naval Brass is a comparatively low cost, high strength and corrosion resistant alloy, widely specified for propeller shafting and marine hardware. It is readily hot headed and finds many applications for forgings, balls, bolts, nuts, rivets, and valve stems.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing
Capacity for Being Cold Worked Fair	Oxyacetylene Welding Good
Capacity for Being Hot Formed Excellent	Carbon Arc Welding Fair
Hot Forgeability Rating	Gas Shielded Arc Welding Fair
(Forging Brass = 100) 90	Coated Metal Arc Welding Not Recom.
Hot Working Temperature	Resistance Welding:
1200°-1500°F. or 650°-825°C.	Spot Good
Annealing Temperature	Seam Fair
800°-1100°F. or 425°-600°C.	Butt Good

MECHANICAL PROPERTIES*

	1/4" Half Hard	1'' Half Hard	
	(Light Annealed)	(Light Annealed)	1'' Hard (9%)
Tensile Strength, p.s.i.	67,000	65,000	75,000
Yield Strength, p.s.i.	40,000	35,000	55,000
Shear Strength, p.s.i.	42,000	42,000	44,000
Elongation, % in 2-in.	35	45	30
Rockwell Hardness	B65	B70	B85

PHYSICAL PROPERTIES*

N. 111 Per 1 0F G-111- 1000	Timuldum 10E0
Melting Point, °F. Solidus 1630	Liquidus 1650
Density, lbs., per cu. in. @ 68 F.	0.304
Specific gravity	8.41
Coefficient of Thermal Expansion	0.0000118 per °F. from 68 F. to 572 F.
Thermal Conductivity	67 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	39.9 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	26 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.09 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	15,000,000 psi
Modulus of Rigidity	5,600,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	73
A.S.T.M.	B21, Alloy A
A.M.S.	4611C, 4612D
Federal	QQ-B-637, Comp. 1
Military	MIL-B-994C (Ships), Comp. A

^{*}All Values nominal. Not to be used as specification requirements.



NAVAL BRASS ROD

COPPER ALLOY NO. 464

ROUND-NON-LFADED
In Standard Mill Lengths

	Diameter	Weight	Dia	ameter	Weight
	Decimal	Lbs. per		Decimal	Lbs. per
	Equivalent	Lin. Ft.		Equivalent	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
1/8	.125	.0448	1 7/16	1.438	5.92
3/16	.188	.101	$1 \ 1/2$	1.500	6.45
1/4	.250	.179	1 5/8	1.625	7.57
5 / 16	.312	.280	1 3/4	1.750	8.77
3/8	.375	.403	1 7/8	1.875	10.1
7/16	.438	.548	2	2.000	11.5
1/2	.500	.716	2 1/8	2.125	12.9
9/16	.562	.907	2 1/4	2.250	14.5
5/8	.625	1.12	2 3/8	2.375	16.2
11/16	.688	1.35	2 1/2	2.500	17.9
3/4	.750	1.61	2 5/8	2.625	19.7
13/16	.812	1.89	2 3/4	2.750	21.7
7/8	.875	2.19	3	3.000	25.8
15/16	.938	2.52	3 1/4	3.250	30.3
1	1.000	2.87	3 1/2	3.500	35.1
1 1/16	1.0625	3.23	3 3/4	3.750	40.3
1 1/8	1.125	3.63	4	4.000	45.8
1 3/16	1.188	4.04	4 1/2	4.500	58.0
1 1/4	1.250	4.48	5	5.000	71.6
1 5/16		4.94	6	6.000	103.0
1 3/8	1.375	5.42			

ROUND-NON-LEADED Suitable for Pump Rods

Specially Straightened-In Exact Lengths

		Length Feet		1		Length Feet	
1 1/8	1.125	11	3.63	3	3.000	14	25.8
1 1/8	1.125	16	3.63	3	3.000	16	25.8
1 1/8	1.125	22	3.63	3	3.000	17	25.8
1 1/4	1.250	11	4.48	3	3.000	18	25.8
1 1/4	1.250	16	4.48	3	3.000	24	25.8
1 1/4	1.250	18	4.48	3 1/2	3.500	16	35.1
1 1/2	1.500	18	6.45	3 1/2	3.500	17	35.1
2	2.000	18	11.5	3 1/2	3.500	18	35.1
2 1/4	2.250	20	14.5	3 1/2	3.500	19	35.1
9 1/9	2 500	22	17.9				

HEXAGONAL-NON-LEADED

In Standard Mill Lengths

3/8	.375	.445	1 1 1/4	1.250	4.94
1/2	.500	.790	1 3/8	1.375	5.97
5/8	.625	1.23	1 1/2	1.500	7.11
11/16	.688	1.49	1 9/16	1.5625	6.99
3/4	.750	1.78	1 11/16	1.6875	8.16
7/8	.875	2.42	1 3/4	1.750	9.68
1	1.000	3.16	2	2.000	12.6
1 1/16	1.0625	3.57	2 1/2	2.500	19.8
1 1/8	1.125	4.00	3 1/8	3.125	25.47

Sizes other than listed can be furnished from mill stocks.

BRASS & BRONZE 9.



LEADED COMMERCIAL BRONZE ROD

COPPER ALLOY NO. 314

CHEMICAL COMPOSITION*

Copper, 89%

Zinc. 9%

Lead, 2%

Leaded Commercial Bronze is extensively used for electrical connectors, hardware. screws, screw machine products, pickling crates and simple forgings. Formerly known as Free-Cutting Commercial Bronze or Hardware Bronze. Machinability is extremely high and tool wear rate very low.

FABRICATION PROPERTIES*

Rating	dility for Being Joined by: It Soldering
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MECHANICAL PROPERTIES*

	1/4" Half Hard (35%)	1/2'' Half Hard (35%)	1'' Half Hard (25%
Tensile Strength, p.s.i.	55,000	55,000	50,000
Yield Strength, p.s.i.	50,000	50,000	45,000
Shear Strength, p.s.i.	31,000	31,000	30,000
Elongation, % in 2-in.	15	20	20
Rockwell Hardness	B65	B61	B58

PHYSICAL PROPERTIES*

Liquidus

Melting Point, °F. Solidus Density, lbs., per cu, in, @ 68 F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

1900

0.319 8.83 0.0000102 per °F from 68 F. to 572 F. 104 Btu./sq. ft./ft./hr./°F. @ 68 F. 24.7 Ohms (circ. mil./ft.) @ 68 F. 42 % IACS @ 68 F. 0.09 Btu./lb./°F. @ 68 F. 17,000,000 psi 6.400.000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. A.M.S.

B140, Alloy B

Federal Military

*All Values nominal. Not to be used as specification requirements.



LEADED COMMERCIAL BRONZE ROD

COPPER ALLOY NO. 314

In Standard Mill Lengths

ROUND-FREE-CUTTING

Diameter		Weight	Di	ameter	Weight
	Decimal Equivalent	Lbs. per Lin. Ft.		Decimal Equivalent	Lbs. per Lin. Ft.
inches	Inches	(Approx.)	Inches	Inches	(Approx.
1/8	.125	.047	11/16	.688	1.42
5/32	.156	.077	3/4	.750	1.69
3/16	.188	.106	13/16	.812	1.98
/4	.250	.188	7/8	.875	2.31
5/16	.312	.294	15/16	.938	2.65
3/8	.375	.423	1	1.000	3.00
3/32	.406	.500	1 1/16	1.0625	3.40
7/16	.438	.576	1 1/8	1.125	3.80
1/2	.500	.751	1 1/4	1.250	4.70
9/16	.562	.951	1 1/2	1.500	6.76
5/8	.625	1.17	2	2.000	12.0
		HEXAGONAL-	FREE-CUTTIN	G	
9/16	.562	1.05	3/4	.750	1.87
		SQUARE-FR	EE-CUTTING		
1/4	.250	.239	3/4	.750	2.15
3/8	.375	.538	7/8	.875	2.93
1/2	.500	.957	1	1.000	3.82
5/8	.625	1.50			

RECTANGULAR-FREE-CUTTING

Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/8	1	.478	1/4	3	2.87
1/8	2	.954	3/8	1	1.43
3/16	1	.715	3/8	2	2.86
1/4	1/2	.477	1/2	3/4	1.43
1/4	3/4	.715	1/2	1	1.91
1/4	1	.955	1/2	1 1/2	2.87
1/4	1 1/4	1.19	1/2	2	3.83
1/4	1 1/2	1.43			

Sizes other than listed can be furnished from mill stocks.



SILNIC® BRONZE ROD

COPPER ALLOY NO. 647

(For Stock Listings, See Page 14, this Section.)

CHEMICAL COMPOSITION*

Copper, 97.5%

Silicon, 0.6%

Nickel, 1.9%

An alloy recently developed by Chase Brass & Copper Co., Silnic Bronze is the outstanding alloy in the silicon bronze family that combines high tensile and high yield strength, high conductivity, excellent cold-forming characteristics, and high corrosion resistance. It is an age-hardenable nickel-silicon bronze, excellent for a wide variety of fasteners including screws, bolts, nuts, split bolt connectors, cotter pins and for electrical connectors, gears, studs, shafts and valve stems. It is readily cold formed and roll threaded in a ductile temper of rod or wire, then heat treated to develop unusually high strength.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by; Soft Soldering Excellent Brazing
Capacity for Being Hot Formed . Excellent	Carbon Arc Welding Good
Hot Forgeability Rating	Gas Shielded Arc Welding
(Forging Brass = 100) —	Coated Metal Arc Welding Good
Hot Working Temperature 1400°-1600°F.	Resistance Welding:
Annealing Temperature	Spot
	Seam
	ButtGood

MECHANICAL PROPERTIES*

	1/4" Rd. Hard**	1/2" Rd. Hard**	1" Rd. Hard**
Tensile Strength, p.s.i.	105,000	102,000	102,000
Yield Strength, p.s.i.	88,000	87,000	87,000
Shear Strength, p.s.i.	53,000	51,500	51,500
Elongation, % in 2-in.	12	20	25
Rockwell Hardness	B93	B94	B96
** Fully heat treated.			

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1970
Density, lbs., per cu. in. @ 68 F.
Specific gravity
Coefficient of Thermal Expansion
Thermal Conductivity
Electrical Resistivity (Annealed)
Electrical Conductivity (Annealed)
Thermal Capacity (Specific Heat)
Modulus of Elasticity (Tension)
Modulus of Rigidity

Liquidus 1990

0.322

0.0000098 per °F. from 68F. to 572F.

32 % IACS @ 68 F. 81 Btu./lb./°F. @ 68 F. 18,000,000 psi

^{*}All Values nominal. Not to be used as specification requirements.



#444 BRONZE ROD

COPPER ALLOY NO. 544

(For Stock Listings, See Following Page.)

CHEMICAL COMPOSITION*

Copper, 88.4%

Zinc. 3.5%

Tin. 4%

Lead, 4%

Phosphorus 0.1%

#444 bronze is a high-leaded free-cutting phosphor bronze in general use for sleeve and thrust bearings, bushings, gears, pinions, screw machine products, screws, shafts, and valve parts.

FARRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)
Rating
Type of Chip S
Capacity for Being Cold Worked Good
Capacity for Being Hot Formed
Hot Forgeability Rating
(Forging Brass = 100) —
Hot Working Temperature
Annealing Temperature
900°-1250°F. or 475°-675°C.

Suitability for Being Joined by:
Soft Soldering Excellent
Brazing
Oxyacetylene Welding . Not Recommended
Carbon Arc Welding Not Recommended
Gas Shielded Arc Welding Not Recom.
Coated Metal Arc Welding Not Recom.
Resistance Welding:
Spot Not Recommended

1.0" Hard (25%) 68,000 57,000 20 B80

Seam Not Recommended Butt..... Fair

MECHANICAL PROPERTIES*

	1/2" Hard (35%)
Tensile Strength, p.s.i.	75,000
Yield Strength, p.s.i.	63,000
Shear Strength, psi.	
Elongation, % in 2-in.	15
Rockwell Hardness	B83

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus Density, lbs., per cu. in. @ 68 F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

0.321 8.89 0.0000096 per °F. from 68F. to 572 F. 50 Btu./sq. ft./ft./hr./°F. @ 68 F.

1830

55 Ohms (circ. mil./ft.) @ 68 F. 19 % IACS @ 68 F.

Liquidus

0.09 Btu./lb./°F. @ 68 F. 15,000,000 psi 5,600,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M.

A.M.S. Federal Military B139, Alloy B2

QQ-B-750, Comp. B

^{*}All Values nominal. Not to be used as specification requirements.



5/8

CHASE METALS SERVICE

SILNIC® BRONZE ROD*

COPPER ALLOY NO. 647

FULLY HEAT TREATED In 12-foot Lengths and Ends

DA	TATE	\mathbf{r}

Diameter		Weight		ameter	Weight
	Decimal	Lbs. per		Decimal	Lbs. per
	Equivalent	Lin. Ft.		Equivalent	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
1/8	.125	.0476	3/4	.750	1.71
3/16	.1875	.107	7/8	.875	2.33
1/4	.250	.190	15/16	.9375	2.68
5/16	.3125	.297	1	1.000	3.04
3/8	.375	.428	1 1/8	1.125	3.85
7/16	.4375	.583	1 1/4	1.250	4.76
1/2	.500	.761	1 3/8	1.375	5.76
9/16	.5625	.963	1 1/2	1.5000	6.85
5/8	.625	1.19			
		HEXA	AGONAL		
3/8	.375	.472	3/4	.750	1.89
1/2	.500	.839	1	1.000	3.36

#444 BRONZE ROD*

1.31

1 1/8

1.125

4.25

COPPER ALLOY NO. 544

(Bearing Bronze)

ROUND In 12-foot Mill Lengths

3/16	.188	.107	3/4	.750	1.71
1/4	.250	.190	7/8	.875	2.33
9/32	.281	.243	15/16	.938	2.68
5/16	.312	.297	1	1.000	3.03
11/32	.344	.362	1 1/16	1.0625	3.42
3/8	.375	.427	1 1/8	1.125	3.84
7/16	.438	.582	1 1/4	1.250	4.75
1/2	.500	.759	1 3/8	1.375	5.80
9/16	.562	.961	1 1/2	1.500	6.84
5/8	.625	1.18	1 5/8	1.625	8.02
11/16	.688	1.44	2	2.000	12.2

^{*} For description of Alloys:

.625

Silnic Bronze - See Page Brass & Bronze 12 #444 Bronze - See Page Brass & Bronze 13

Sizes other than listed can be furnished from mill stocks.



PHOSPHOR BRONZE, 5% ROD

(Grade A)

COPPER ALLOY NO. 510

(For Stock Listings, See Page 17, this Section.)

CHEMICAL COMPOSITION*

Copper, 95%

Tin. 4.75%

Phosphorus, 0.25%

Phosphor Bronze, 5% (A) is a copper-tin alloy deoxidized with phosphorus. It has great resilience, endurance and hardness, combined with superior corrosion resistance. Extensively used for sleeve and thrust bearings, bushings, clamps, gears, ring travelers, screws, shafts, spindles, studs, turnbuckles, U-bolts and valve stems.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)	
Rating	0
Type of Chip	L
Capacity for Being Cold Worked . Exceller	ıt
Capacity for Being Hot Formed Poor	r
Hot Forgeability Rating	
(Forging Brass = 100)	-
Hot Working Temperature	-
Annealing Temperature	
900°-1250°F. or 475°-675°C	

Suitability for Being Joined by:
Soft Soldering Excellent
Brazing Excellent
Oxyacetylene Welding Fair
Carbon Arc Welding Good
Gas Shielded Arc Welding Good
Coated Metal Arc Welding Fair
Resistance Welding:
Spot Good
Seam Fair

Butt..... Excellent

MECHANICAL PROPERTIES*

Tensile Strength, p.s.i. Yield Strength, p.s.i. Shear Strength, p.s.i. Elongation, % in 2-in. Rockwell Hardness 1/2" Hard (30%) 75,000 65,000

B80

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1750
Density, lbs., per cu. in. @ 68 F.
Specific gravity
Coefficient of Thermal Expansion
Thermal Conductivity
Electrical Resistivity (Annealed)
Electrical Conductivity (Annealed)
Thermal Capacity (Specific Heat)
Modulus of Elasticity (Tension)
Modulus of Rigidity

0.320 8.86 0.0000099 per °F. from 68 F. to 572 F. 40 Btu./sq. ft./ft./hr./°F. @ 68 F. 69.1 Ohms (circ. mil./ft.) @ 68 F. 15 % IACS @ 68 F.

1920

15 % IACS @ 66 F. 0.09 Btu./lb./°F. @ 68 F. 16,000,000 psi 6.000,000 psi

Liquidus

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. 81 B139, Alloy A

A.M.S. Federal

4625D QQ-B-750, Comp. A

Military

MIL-B-892 (Ships) Amend. #1

^{*}All Values nominal. Not to be used as specification requirements.



LEADED PHOSPHOR BRON7F ROD

(Grade B1) COPPER ALLOY NO. 534

CHEMICAL COMPOSITION*

Copper, 94%

Tin. 4.75%

Phosphorus, 0.25%

Lead, 1%

Leaded Phosphor Bronze (Grade B1) rod is a relatively free-cutting phosphor bronze used for bearings, bushings, gears, screw machine products, spindles and valve parts. Combines high corrosion resistance and strength with excellent wear resistance.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)
Rating 50
Type of Chip M
Capacity for Being Cold Worked Fair
Capacity for Being Hot Formed Poor
Hot Forgeability Rating
(Forging Brass = 100)
Hot Working Temperature
Annealing Temperature

Suitability for Being Joined by:
Soft Soldering
Brazing —
Oxyacetylene Welding Not Recommended
Carbon Arc Welding Not Recommended
Gas Shielded Arc Welding
Coated Metal Arc Welding Fair
Resistance Welding:
Spot Not Recommended
Seam Not Recommended
ButtNot Recommended

MECHANICAL PROPERTIES*

Tensile Strength, p.s.i. Yield Strength, p.s.i. Shear Strength, p.s.i. Elongation, % in 2-in. Rockwell Hardness

70,000 58,000 25

B78

1.0" Rd. Hard (20%)

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus Density, lbs., per cu. in. @ 68 F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

Liquidus 1920 0.322

0.0000099 per °F. from 68°F. to 572°F. 37 Btu./sq. ft./ft./hr./°F. @ 68 F.

14 % IACS @ 68 F.

15,000,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M.

B139, Alloy B1

A.M.S.

Federal

Military

^{*}All Values nominal. Not to be used as specification requirements.



PHOSPHOR BRONZE 5% ROD

In Standard Mill Lengths

ROUND-GRADE "A" -NON-LEADED

COPPER ALLOY NO. 510

Di	ameter	Weight	Di	ameter	Weight
	Decimal Equivalent	Lbs. per Lin. Ft.		Decimal Equivalent	Lbs. per Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
5/32	.1562	.0743	7/8	.875	2.31
3/16	.188	.106	15/16	.938	2.64
1/4	.250	.188	1	1.000	3.01
5/16	.312	.294	1 1/8	1.125	3.81
3/8	.375	.423	1 1/4	1.250	4.70
7/16	.438	.576	1 3/8	1.375	5.69
1/2	.500	.752	1 1/2	1.500	6.77
9/16	.562	.951	1 5/8	1.625	7.95
5/8	.625	1.18	1 3/4	1.750	9.21
11/16	.688	1.42	1 7/8	1.875	10.6
3/4	.750	1.70	2	2.000	12.1

(For Data, See Page 15, this Section.)

ROUND-GRADE "B1" -LEADED

COPPER ALLOY NO. 534

1/8	.125	.0476	7/8	.875	2.33
3/16	.188	.107	15/16	.937	2.55
1/4	.250	.190	1	1.000	3.04
5/16	.312	.297	1 1/8	1.125	3.85
3/8	.375	.428	1 1/4	1.250	4.76
7/16	.438	.583	1 3/8	1.375	5.76
1/2	.500	.761	1 1/2	1.500	6.85
9/16	.562	.963	1 3/4	1.750	9.32
5/8	.625	1.19	2	2.000	12.2
3/4	750	1.71			





TOLERANCES FOR BRASS & BRONZE ROD

ROD

COLD DRAWN TO FINAL SIZE

TOLERANCES ON DIAMETER OR DISTANCE BETWEEN PARALLEL SURFACES
In Inches

The following tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.

The tolerances for rod up to 0.150", inclusive, in this table, are greater than for similar sizes in wire, but are required by dimensional changes resulting from the straightening operation, which changes are negligible in sizes over 0.150".

Diameter or Distance	Non-Refractory Alloys ^a		Refractory Alloys ^b	
between Parallel Surfaces in Inches	Round	Hexagonal Octagonal	Round	Hexagonal Octagonal
Up to .150 inclusive	.0013 .0015 .002 .0025 0.15%*	.0025 .003 .004 .005 0.30%*	.002 .002 .003 .004 0.20%*	.004 .005 .006 0.40%*

*Expressed to the nearest 0.001"

a. NON-REFRACTORY ALLOYS include Free-Cutting Brass, Leaded Commercial Bronze, Naval Brass and Leaded Naval Brass.

b. REFRACTORY ALLOYS include Silnic® Bronze, Phosphor Bronze, 5% (A) and 444 Bronze (Bearing Bronze).

ROD LENGTH TOLERANCES In Inches

Tolerances are all plus. If all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

Lengths	Applicable Only to Full Length Pieces
Specific Lengths	3/8 1

SCHEDULE OF SHORT LENGTHS—ROD Applicable to Specific Lengths with Ends Applies to Free-Cutting Brass, Naval Brass, Leaded Commercial Bronze and Leaded Naval Brass

Round, Hexagonal, Octagonal Diameter or Distance Between Parallel Surfaces in Inches	Indicated Length in Feet	Minimum Length* of Shortest Piece in % of Indicated Length	Maximum Permissible Weight of Ends in % of Lot Weight
Up to 1/2 inclusive	6 to 14 incl.	75	20
Over 1/2 to 1 inclusive	6 to 14 incl.	70	30
Over 1 to 1 1/2 inclusive	6 to 12 incl.	60	40
Over 1 1/2 to 2 inclusive	6 to 12 incl.	50	45
Over 2 to 3 inclusive	6 to 10 incl.	40	50

*Expressed to nearest 1/2 foot.

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.

TOLERANCES FOR BRASS & BRONZE ROD

OD

SCHEDULE OF SHORT LENGTHS
Applicable to Specific Lengths with Ends

Applies to Silnic Bronze, Phosphor Bronze, 5% (A) and 444 Bronze (Bearing Bronze)

Round, Hexagonal, Octagonal Diameter or Distance Between Parallel Surfaces in Inches	Indicated Length in Feet	Minimum Length* of Shortest Piece in % of Indicated Length	Maximum Permissible Weight of Ends in % of Lot Weight
Up to 1/2 inclusive Over 1/2 to 1 inclusive Over 1 to 1 1/2 inclusive Over 1 1/2 to 2 inclusive	6 to 12 incl.	65	30
	6 to 12 incl.	60	40
	6 to 10 incl.	50	50
	6 to 10 incl.	40	60

^{*}Expressed to nearest 1/2 foot.

STRAIGHTNESS TOLERANCES

ROD

Applicable to any longitudinal surface or edge

Drawn Rod

Length (In Feet) Maximum Curvature (Depth of Arc) (In Inches)

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.

BRASS & BRONZE 19.

DATA



TOLERANCES FOR BRASS BAR (Rolled or Drawn)

Includes Squares

ROUNDED EDGES, SQUARE EDGES, OR ROUNDED CORNERS

The following tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.

THICKNESS TOLERANCES (In Inches)

FREE-CUTTING BRASS BAR

		Width in Inches						
Thickness in Inches	Up to 1/2 incl.	Over 1/2 to 1 1/4 incl.	Over 1 1/4 to 2.00 incl.	to	to	Over 8.00 to 12.00 incl.		
Over .090 to .130 inclusive Over .130 to .188 inclusive Over .188 to .500 inclusive Over .500 to 1.00 inclusive Over 1.00 to 2.00 inclusive Over 2.00 to 4.00 inclusive	.003	.0025 .0035 .004 .0045 .005	.0035 .004 .0045 .005	.004 .0045 .0045 .005 .006 0.30%*	.006 .007 .008	.008		

^{*}Expressed to the nearest .001"

WIDTH TOLERANCES (In Inches)

For Rectangles (Not Including Squares) (For Squares use Thickness Tolerances above)

Width in Inches	Width Tolerances in Inches Free-Cutting Brass
Up to .050 inclusive Over .050 to .090 inclusive Over .090 to .130 inclusive Over .130 to .188 inclusive Over .188 to .500 inclusive Over .500 to 1.25 inclusive Over 1.25 to 2.00 inclusive Over 2.00 to 4.00 inclusive Over 4.00 to 12.00 inclusive	.0013 .0015 .002 .003 .0035 .005 .008 .012

^{*}Expressed to the nearest .001".

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.





TOLERANCES FOR BRASS BAR (Rolled or Drawn)

LENGTH TOLERANCES^a (In Inches)

Tolerances are all plus. If all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

Lengths	Applicable Only to Full Length Pieces
Specific Lengths	3/8 1

SCHEDULE OF SHORT LENGTHS

Applicable to Specific Lengths with Ends

FREE-CUTTING BRASS

Square Bars Side in Inches	Rectangular Bars Area* in Square Inches	Indicated Length in Feet	Minimum Length** of Shortest Piece in % of Indicated Length	Maximum Permissible Weight of Ends in % of Lot Weight
Up to 1/2 inclusive		6 to 14 incl.	75	20
Over 1/2 to 1 inclusive		6 to 14 incl.	70	30
Over 1 to 1 1/2 inclusive		6 to 12 incl.	60	40
Over 1 1/2 to 2 inclusive		6 to 12 incl.	50	45
Over 2 to 3 inclusive		6 to 10 incl.	40	50

a. Not applicable to bar with sheared or sawed edges.

* Width times Thickness, disregarding any rounded corners or edges.

** Expressed to nearest 1/2 foot.

STRAIGHTNESS TOLERANCES

Applicable to any longitudinal edge of material supplied in nominally flat straight lengths.

For material having a cross-sectional area 0.010 square inch and over, and a thickness 0.010 inch and over, furnished in straight lengths.

1/2" maximum edgewise curvature (depth of arc) in any 6-foot portion of the total length.

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.



MACHINABILITY RATINGS OF CHASE BRASS & COPPER RODS

The machinability ratings given below for Chase brass and copper rods are arbitrary ratings which at best must be considered as an approximate relative indication. There being no such thing as absolute machinability, we have tried to present a fairly accurate relative picture by using two criteria rather than a single one. The numerical rating is a reasonable indication of the amount of power required for any given type and degree of cutting operation, and tool life will be found to vary more or less in proportion to such a rating. However, as is well known, this is by no means the only or final criterion by which cutting properties are to be judged. The type of chip also plays a most important part.

In certain operations, practically any type of chip can be tolerated whereas in others, as, for instance, deep drilling, box milling, tapping, etc., long, stringy chips or even moderately curly but tough chips cause excessive difficulty, scoring of work, tool breakage, etc.

In the table following in a column headed "Type Chip" will be found an index letter, either L, M, S, or MS indicating that the chips are long, medium, short, or medium-short, respectively.

For convenience in classification, rod alloys are grouped in 3 sections:

- 1. FREE-CUTTING (Those containing lead or tellurium, and rating a machinability of 70 or higher, and producing short or medium-short chips.)
- 2. EASILY MACHINABLE (Those rating a machinability of between 30 and 70.)
- 3. MACHINABILITY RATING OF 20.

	ALLOY	COMPOSITION	MACHINABILITY RATING (Free-Cutting Brass = 100)	TYPE CHIP
1.	FREE-CUTTING ALLOYS			
	Free-Cutting Brass	62 Copper, 34.75 Zinc, 3.25 Lead	100	S
	Tellurium Copper	99.5 Copper, 0.5 Tellurium, 0.007 Phosphorus	90	s
	444 Bronze	88.4 Copper, 3.5 Zinc, 4.0 Tin, 4.0 Lead	80	S
	Leaded Commercial Bronze	89 Copper, 9.0 Zinc,	80	MS
	Leaded Naval Brass	60 Copper, 36.75 Zinc, 0.75 Tin, 2.0 Lead	70	S
2.	EASILY MACHINABLE ALLOYS			
	Silnic Bronze	97.5 Copper, 0.6 Silicon,	40	L
	Naval Brass	60 Copper, 38.75 Zinc, 0.75 Tin	30	L
3.	ALLOYS WITH MACHINABILITY RATING OF 20			
	Copper	99.9+ Copper, about 0.04 Oxygen		L
	Phosphor Bronze, 5%(A)	95 Copper, 4.75 Tin, 0.25 Phosphorus		L





BRASS SHEET, STRIP & PLATE



Brass and its many alloys, as sheet and strip (either flat or in rolls) or plate are adaptable to a wide range of fabrication processes, including deep drawing, stamping, punching, spinning, embossing, rolling, etching, soldering, polishing and plating.

Brass alloys vary in composition and physical properties, thereby giving fabricators a wide variety from which to choose for their own special needs.

The special finishes for some alloys (polished, plated) are available on order. The fabrication processes to which the metal is subjected dictate the type of finish desired; however, in many cases special finishes can be applied to increase your production and to reduce your costs.

Many of our Metals Service Centers are equipped with modern cutting facilities, such as metal slitters, shears and saws, to give you quicker deliveries of the exact widths of sheet and strip that you need, if you require other than standard sizes. In many cases this service eliminates the need of special mill runs and can save time and money.

Sheet, strip and plate in many of the brass alloys are stocked in Chase Metals Service Centers. They are available in many tempers, finishes, gauges and sizes.



CARTRIDGE BRASS, 70% SHEET AND STRIP

COPPER ALLOY NO. 260

CHEMICAL COMPOSITION*

Copper, 70%

Zinc. 30%

Cartridge Brass, 70% has excellent tensile strength and is very ductile, being better than Yellow Brass in this respect. It can be subjected to severe cold working in deep drawing, spinning, rolling, stamping, flaring and forming. Formerly known as Deep Drawing Brass, Grommet Brass, Spring Brass and Spinning Brass, these names are an indication of its fabricating qualities. It is ideally suited for the production of artillery and small arms cartridge cases and for musical instruments, snap fasteners, eyelets, reflectors, lighting fixtures, and automobile radiators.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)	Suitability for Being Joined by:
Rating	Soft Soldering Excellent
Type of Chip L	Brazing Excellent
Capacity for Being Cold Worked .Excellent	Oxyacetylene Welding Good
Capacity for Being Hot Formed Fair	Carbon Arc Welding Fair
Hot Forgeability Rating	Gas Shielded Arc Welding Fair
(Forging Brass = 100)	Coated Metal Arc Welding Not Recom.
Hot Working Temperature	Resistance Welding:
1350°-1550°F. or 725°-850°C.	SpotGood
Annealing Temperature	Seam Not Recommended
800°-1400°F. or 425°-750°C.	Butt

MECHANICAL PROPERTIES* (all 0.040 gauge sheet)

	0.035 mm Annealed	Spring (60%)
Tensile Strength, p.s.i.	49,000	94,000
Yield Strength, p.s.i.	17,000	65,000
Shear Strength, p.s.i.	34,000	48,000
Elongation, % in 2-in.	57	3
Rockwell Hardness	F68, 30T31	B91. 30T77

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1680	Liquidus 1750
Density, lbs., per cu. in. @ 68 F.	0.308
Specific gravity	8.53
Coefficient of Thermal Expansion	0.0000111 per °F. from 68 F. to 572 F.
Thermal Conductivity	70 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	37 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	28 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.09 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	16,000,000 psi
Modulus of Rigidity	6,000,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	70A and B
A.S.T.M.	B36, Alloy 6
A.M.S.	4505D, 4507C
Federal	QQ-B-613b, Comp. 2 and 11
Military	MIL-C-895A (Navy)

^{*}All Values nominal. Not to be used as specification requirements.



FLAT CARTRIDGE BRASS, 70% SHEET

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

SOFT TEMPER In 6 to 8-foot Mill Lengths

Thi	ckness		Weight	Thic	kness		Weight
Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)	Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)
1/4 3/16 No. 8 No. 8 No. 8	.250 .188 .1285 .1285 .1285	12 12 6 12 24	11.01 8.26 2.83 5.66 11.32	No. 16 No. 16 No. 17 No. 17 No. 18	.0508 .0508 .0453 .0453	12 24 6 12 8	2.24 4.48 .998 1.99 1.19
1/8 1/8 No. 10 No. 11 No. 11	.125 .125 .1019 .0907	12 24 12 6	5.51 11.0 4.48 2.00 4.00	No. 18 No. 18 No. 19 No. 20 No. 20	.0403 .0403 .0403 .0359 .0320	12 24 12 12 24	1.78 3.55 1.58 1.41 2.82
No. 12 No. 12 No. 12 No. 14 No. 14	.0808 .0808 .0808 .0641 .0641	6 12 24 6 8	1.78 3.56 7.12 1.41 1.88	No. 22 No. 22 No. 24 No. 24 No. 25	.0253 .0253 .0201 .0201 .0179	12 24 12 24 12	1.11 2.24 .885 1.77 .789
No. 14 No. 14 No. 15 No. 16	.0641 .0641 .0571 .0508	12 24 12 6	2.82 5.65 2.52 1.12	No. 26 No. 28 No. 30	.0159 .0126 .0100	12 12 12	.701 .556 .441
			In Exact Siz	es as Listed			
No. 16		10'' Multi- ples of 13-15/16''	1.87			• •	
			Shearing and	Cutting Stock			
		For C	In Flat	Lengths mers' Specific	cations		
1/8 No. 11 No. 12 No. 13 No. 14	.125 .0907 .0808 .0720 .0641	24 24 24 24 24 24		No. 16 No. 18 No. 20 No. 22	.0508 .0403 .0320 .0253	24 24 24 24	
		P	rocess S-19 Quarter Ha	Etching Quali	ty		
			In Flat 7 to 8-	-			
No. 18 No. 20 No. 20 No. 22 No. 22 No. 24	.0403 .0320 .0320 .0253 .0253 .0201	12 12 14 12 14 12	1.78 1.41 1.64 1.11 1.30	No. 26 No. 26 No. 28 No. 28 No. 30	.0159 .0159 .0126 .0126 .0100	12 18 12 14 12	.701 1.05 .556 .648 .441

Sizes other than listed can be furnished from mill stocks or cut from wider stock.



FLAT CARTRIDGE BRASS, 70% SHEET

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

DRY ROLLED—QUARTER HARD TEMPER In 8 and 12-foot Lengths and Ends

Thic	kness		Weight	Thic	kness		Weight
Inches &	Decimal		Lbs. per	Inches &	Decimal		Lbs. per
B. & S.	Equivalent	Width	Lin. Ft.	B. & S.	Equivalent	Width	Lin. Ft.
Gauge	Inches	Inches	(Approx.)	Gauge	Inches	Inches	(Approx.)
No. 14	.0641	12	2.82	No. 18	.0403	12	1.78
No. 16	.0508	8	1.49	No. 20	.032	12	1.41
No. 16	.0508	10	1.87	No. 24	.0201	10	.737
No. 16	.0508	12	2.24	No. 24	.0201	12	.885
				D TEMPER			
			In 6 to 8-foot	Mill Lengths			
1/2	.500	12	22.0	No. 11	.0907	14	4.67
3/8	.375	12	16.5	No. 11	.0907	24	8.00
5/16	.312	12	13.8	No. 12	.0808	6	1.78
1/4	.250	12	11.0	No. 12	.0808	8	2.37
1/4	.250	24	22.0	No. 12	.0808	10	2.97
3/16	.188	12	8.26	No. 12	.0808	12	3.56
3/16	.188	16	11.0	No. 12	.0808	14	4.15
3/16	.188	24	16.5	No. 12	.0808	24	7.12
5/32	.156	12	6.88	No. 13	.0720	6	1.58
5/32	.156	24	13.7	No. 13	.0720	12	3.16
No. 8	.1285	12	5.66	No. 14	.0641	6	1.41
No. 8	.1285	24	11.32	No. 14	.0641	8	1.88
1/8	.125	3	1.38	No. 14	.0641	10	2.35
1/8	.125	6	2.75	No. 14	.0641	12	2.82
1/8	.125	7	3.21	No. 14	.0641	14	3.29
1/8	.125	8	3.67	No. 14	.0641	16	3.76
1/8	.125	10	4.59	No. 14	.0641	18	4.24
1/8	.125	12	5.51	No. 14	.0641	20	4.70
1/8	.125	14	6.43	No. 14	.0641	24	5.64
1/8	.125	16	7.34	1/16	.0625	1/2	.115
1/8	.125	18	8.26	No. 15	.0571	12	2.52
1/8	.125	20	9.18	No. 15	.0571	24	5.03
1/8	.125	24	11.02	No. 16	.0508	6	1.12
No. 10	.1019	6	2.24	No. 16	.0508	8	1.49
No. 10	.1019	8	3.00	No. 16	.0508	10	1.87
No. 10	.1019	10	3.74	No. 16	.0508	12	2.24
No. 10	.1019	12	4.48	No. 16	.0508	14	2.61
No. 10	.1019	14	5.24	No. 16	.0508	16	2.99
No. 10	.1019	24	8.98	No. 16	.0508	18	3.35
3/32	.0938	6	2.07	No. 16	.0508	20	3.74
3/32	.0938	8	2.75	No. 16	.0508	24	4.48
3/32	.0938	12	4.13	No. 17	.0453	6	.998
No. 11	.0907	6	2.00	No. 17	.0453	8	1.34
No. 11	.0907	8	2.66	No. 17	.0453	10	1.66
No. 11	.0907	10	3.33	No. 17	.0453	12	1.99
No. 11	.0907	12	4.00	No. 17	.0453	24	4.00

Continued

For Data, See Page 24, this Section.

Sizes other than listed can be furnished from mill stocks or cut from wider stock.



FLAT CARTRIDGE BRASS, 70% SHEET

COPPER ALLOY NO. 260 (Yellow Brass or High Brass)

HALF HARD TEMPER

In 6 to 8-foot Mill Lengths

Continued

Thickness			Weight	1	Thic	kness		Weight	
	Inches &	Decimal		Lbs. per		Inches &	Decimal		Lbs. per
	B. & S.	Equivalent	Width	Lin. Ft.		B. & S.	Equivalent	Width	Lin. Ft.
	Gauge	Inches	Inches	(Approx.)	1	Gauge	Inches	Inches	(Approx.)
	No. 18	.0403	6	.888		No. 22	.0253	8	.744
	No. 18	.0403	8	1.19	1	No. 22	.0253	10	.929
	No. 18	.0403	10	1.48	1	No. 22	.0253	12	1.11
	No. 18	.0403	12	1.78		No. 22	.0253	14	1.30
	No. 18	.0403	14	2.07		No. 22	.0253	16	1.49
	No. 18	.0403	16	2.38		No. 22	.0253	18	1.67
	No. 18	.0403	18	2.66		No. 22	.0253	24	2.23
	No. 18	.0403	20	2.96		No. 24	.0201	8	.590
	No. 18	.0403	24	3.55		No. 24	.0201	10	.737
	No. 19	.0359	6	.791		No. 24	.0201	12	.885
	No. 19	.0359	8	1.05		No. 24	.0201	14	1.04
	No. 19	.0359	12	1.58	1	No. 24	.0201	16	1.18
	No. 20	.0320	6	.705		No. 24	.0201	18	1.33
	No. 20	.0320	8	.940		No. 24	.0201	24	1.77
	No. 20	.0320	10	1.17		No. 25	.0179	12	.789
			12	1.41		No. 26	.0159	6	.350
	No. 20	.0320						8	
	No. 20	.0320	14	1.64		No. 26	.0159		.467 .701
	No. 20	.0320	16	1.88		No. 26	.0159	12	
	No. 20	.0320	18	2.22		No. 28	.0126	12	.556
	No. 20	.0320	20	2.35	1	No. 30	.0100	12	.441
	No. 20	.0320	24	2.82	1	No. 32	.0080	12	.353
				Exact Ler	ngths	of 4 Feet			
	No. 22	.0253	24	2.23	1	No. 24	.0201	24	1.77
				Obt		tti Ctaala			
				Shearing an In 8-foot R					
			For C	Cutting to Cus			ations		
	3/8	.375	12		1	1/16	.0625	24	
	5/16	.312	24			No. 15	.0571	24	
	1/4	.250	24		1	No. 16	.0508	24	
	3/16	.188	24			No. 16	.0508	24-1/2	• • •
	5/32	.156	24			No. 17	.0453	24	
	1/8	.125	24			No. 18	.0403	24	
	No. 9	.1144	24		1	No. 18	.0403	24-1/2	
	No. 10	.1019	24		1	No. 19	.0359	24	
	3/32	.0938	24		Į.	No. 20	.0320	24	
	3/32	.0938	24 1/2			No. 20	.0320	24 1/2	
	No. 11	.0907	24			No. 22	.0253	24	
	No. 12	.0808	24			No. 22	.0253	24-1/2	
	No. 12	.0808	$24 \ 1/2$			No. 24	.0201	24	
	No. 13	.0720	24			No. 24	.0201	24-1/2	
	No. 14	.0641	24			No. 26	.0159	24	
	No. 14	.0641	24-1/2			No. 26	.01 59	24-1/2	
						No. 28	.0126	12	

For Data, See Page 24, this Section. Sizes other than listed can be furnished from mill stocks or cut from wider stock.

FLAT CARTRIDGE BRASS, 70% STRIP

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

HALF HARD TEMPER—SLIT OR SHEARED EDGES In 8 to 10-foot Lengths

Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/16	1/4	.0574	1/16	1 3/4	.403
1/16	5/16	.0717	1/16	2	.461
1/16	3/8	.0861	1/16	2 1/2	.576
1/16	1/2	.115	1/16	3	.691
1/16	5/8	.143	3/32	1/2	.172
1/16	3/4	.172	3/32	3/4	.259
1/16	7/8	.201	3/32	1	.345
1/16	1	.230	3/32	1 1/2	.518
1/16	1 1/8	.259	3/32	2	.691
1/16	1 1/4	.287	1/8	3	1.38
1/16	1 1/2	.345	1		

HALF HARD TEMPER—SAWED EDGES In 8-foot Lengths and Ends

1/8 3 1.38

For heavier cross-sections, see Rectangular Brass Bar, Brass & Bronze Page 5.

SPRING TEMPER In Flat 6 to 8-foot Mill Lengths

Thi	Decimal		Weight Lbs. per	Thi	ickness Decimal		Weight Lbs. per
B. & S. Gauge	Equivalent Inches	Width Inches	Lin. Ft. (Approx.)	B. & S. Gauge	Equivalent Inches	Width Inches	Lin. Ft. (Approx.)
No. 8 No. 11 No. 12 No. 14 No. 14	.1285 .0907 .0808 .0641	12 12 12 8 12	5.51 4.00 3.56 1.90 2.82	No. 20 No. 20 No. 22 No. 22 No. 24	.0320 .0320 .0253 .0253 .0201	12 24 12 24 12	1.52 2.82 1.12 2.24 .894
No. 14 No. 16 No. 16 No. 16 No. 18	.0641 .0508 .0508 .0508 .0403	24 8 12 24 12 24	5.65 1.50 2.24 4.48 1.78 3.55	No. 24 No. 26 No. 26 No. 28 No. 30	.0201 .0159 .0159 .0126 .0100	24 12 24 12	1.77 .708 1.40 .561 .44

For Data, See Page 24, this Section.
Sizes other than listed can be furnished from mill stocks
or cut from wider stock.





CARTRIDGE BRASS, 70% IN ROLLS

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

SOFT TEMPER

Thick			Weight	Thi	ckness		Weight Lbs. per
	Decimal		Lbs. per	D 0 0	Decimal	7772 241	Lin. Ft.
B. & S. I Gauge	Equivalent Inches	Width Inches	Lin. Ft. (Approx.)	B. & S. Gauge	Equivalent Inches	Width Inches	(Approx.)
No. 12	.0808	6	1.78	No. 20	.0320	16	1.88
No. 12	.0808	12	3.56	No. 20	.0320	18	2.22
No. 14	.0641	6	1.41	No. 20	.0320	24	2.92
No. 14	.0641	8	1.88	No. 21	.0285	6	.629
No. 14	.0641	10	2.35	No. 21	.0285	8	.837
No. 14	.0641	12	2.82	No. 21	.0285	12	1.27
No. 14	.0641	14	3.29	No. 21	.0285	14	1.46
No. 16	.0508	6	1.12	No. 22	.0253	4 9/16	.425
No. 16	.0508	8	1.49	No. 22	.0253	5	.466
No. 16	.0508	10	1.87	No. 22	.0253	5 1/2	.511
No. 16	.0508	12	2.24	No. 22	.0253	6	.557
No. 16	.0508	14	2.61	No. 22	.0253	6 3/8	.593
No. 16	.0508	16	2.99	No. 22	.0253	61/2	.602
No. 16	.0508	18	3.36	No. 22	.0253	7	.666
No. 17	.0453	6	.998	No. 22	.0253	$7 \ 1/2$.699
No. 17	.0453	12	1.99	No. 22	.0253	8	.744
No. 18	.0403	5	.740	No. 22	.0253	$8 \ 1/2$.789
No. 18	.0403	6	.888	No. 22	.0253	9	.856
No. 18	.0403	6 1/4	.925	No. 22	.0253	$9 \ 1/2$.893
No. 18	.0403	7	1.04	No. 22	.0253	10	.929
No. 18	.0403	8	1.19	No. 22	.0253	12	1.11
No. 18	.0403	9	1.33	No. 22	.0253	14	1.30
No. 18	.0403	10	1.48	No. 22	.0253	16	1.49
No. 18	.0403	11	1.62	No. 22	.0253	18	1.67
No. 18	.0403	12	1.78	No. 22	.0253	24	2.23
No. 18	.0403	14	2.07	No. 23	.0226	6	.498
No. 18	.0403	16	2.38	No. 23	.0226	7	.581
No. 18	.0403	18	2.66	No. 23	.0226	10	.829
No. 18	.0403	20	2.96	No. 23	.0226	12	.996
No. 18	.0403	24	3.55	No. 23	.0226	14	1.16
No. 19	.0359	6	.791	No. 24	.0201	5 1/2	.332
No. 19	.0359	10	1.32	No. 24	.0201	6	.443
No. 19	.0359	12	1.58	No. 24	.0201	8	.590
No. 20	.0320	5	.585	No. 24	.0201	10	.737
No. 20	.0320	$5 \ 1/2$.645	No. 24	.0201	12	.885
No. 20	.0320	6	.705	No. 24	.0201	14	1.04
No. 20	.0320	61/4	.734	No. 24	.0201	16	1.18
No. 20	.0320	61/2	.766	No. 24	.0201	18	1.33
No. 20	.0320	7	.822	No. 24	.0201	24	1.77
No. 20	.0320	8	.940	No. 25	.0179	6	.394
No. 20	.0320	9	1.06	No. 25	.0179	10	.657
No. 20	.0320	10	1.17	No. 25	.0179	12	.789
No. 20	.0320	11	1.29	No. 25	.0179	14	.920
No. 20	.0320	12	1.51	No. 26	.0159	5	.292
No. 20	.0320	14	1.64	No. 26	.0159	6	.350

Continued

For Data, See Page 24, this Section. Sizes other than listed can be furnished from mill stocks

or cut from wider stock.



CARTRIDGE BRASS, 70% IN ROLLS

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

SOFT TEMPER

Continued

Thi	ckness		Weight	Thi	ckness		Weight
	Decimal		Lbs. per		Decimal		Lbs. per
B. & S.	Equivalent	Width	Lin. Ft.	B. & S.	Equivalent	Width	Lin. Ft.
Gauge	Inches	Inches	(Approx.)	Gauge	Inches	Inches	(Approx.)
No. 26	.0159	7	.409	No. 30	.0100	12	.441
No. 26	.0159	8	.467	No. 30	.0100	14	.514
No. 26	.0159	10	.584	No. 32	.0080	6	.176
No. 26	.0159	12	.701	No. 32	.0080	8	.235
No. 26	.0159	14	.817	No. 32	.0080	10	.294
No. 26	.0159	16	.935	No. 32	.0080	12	.353
No. 26	.0159	18	1.05	No. 34	.0063	6	.139
No. 27	.0142	6 1/4	.328	No. 34	.0063	12	.277
No. 27	.0142	12	.625	No. 36	.0050	6	.110
No. 28	.0126	5 1/8	.237	No. 36	.0050	8	.147
No. 28	.0126	6	.277	No. 36	.0050	10	.184
No. 28	.0126	8	.370	No. 36	.0050	12	.220
No. 28	.0126	10	.462	No. 38	.0040	6	.088
No. 28	.0126	12	.556	No. 40	.0031	6	.068
No. 30	.0100	6	.220		.0030	6	.066
No. 30	.0100	8	.294	No. 44	.0020	6	.044
No. 30	.0100	10	.367	No. 50	.0010	6	.022

Slitting Stock

For Slitting to Customers' Specifications

Soft Temper

No. 14	.0641	24 plus	 No. 23	.0226	24 plus	
No. 16	.0508	24 plus	 No. 24	.0201	24 plus	
No. 17	.0453	24 plus	 No. 25	.0179	24 plus	
No. 18	.0403	24 plus	 No. 26	.0159	24 plus	
No. 19	.0359	24 plus	 No. 27	.0142	24 plus	
No. 20	.0320	24 plus	 No. 28	.0126	24 plus	
No. 21	.0285	24 plus	 No. 30	.0100	24 plus	
No. 22	.0253	24 plus				

Process S-19 Jewelry Quality

No. 16 No. 19 No. 20	.0508 .0359 .0320	6 6 6	1.12 .791 .705	No. 21 No. 22	.0285 .0253	6 6	.629 .557
			Quarter H	lard Temper			
No. 16	.0508	6	1.12	No. 20	.0320	12	1.41

No. 16	.0508	12	2.24	No. 22	.0253	12	1.11
No. 17	.0453	6	1.00	No. 23	.0226	12	1.00
No. 17	.0453	12	2.00	No. 24	.0201	12	.885
No. 18	.0403	12	1.78	No. 25	.0179	12	.788
No. 19	.0359	6	.791	No. 26	.0159	12	.700
17 10	0050	1.0	1 50	NO 30	0100	12	440

For Data, See Page 24, this Section.

Sizes other than listed can be furnished from mill stocks or cut from wider stock.



CARTRIDGE BRASS, 70% IN ROLLS

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

Slitting Stock

For Splitting to Customers' Specifications

Quarter Hard Temper

Thi	ickness		Weight	Thi	ckness		Weight
	Decimal		Lbs. per		Decimal	:	Lbs. per
B. & S.	Equivalent	Width	Lin. Ft.	B. & S.	Equivalent	Width	Lin. Ft.
Gauge	Inches	Inches	(Approx.)	Gauge	Inches	Inches	(Approx.)
No. 16	.0508	24 plus		No. 22	.0253	24 plus	
No. 18	.0403	24 plus		No. 24	.0201	24 plus	
No. 20	.0320	24 plus					
			Half Hai	rd Temper			
No. 14	.0641	24 plus		No. 22	.0253	24 plus	
No. 16	.0508	24 plus		No. 23	.0226	24 plus	
No. 17	.0453	24 plus		No. 24	.0201	24 plus	
No. 18	.0403	24 plus		No. 25	.0179	24 plus	
No. 19	.0359	24 plus		No. 26	.0159	24 plus	
No. 20	.0320	24 plus		No. 27	.0142	24 plus	
No. 21	0285	24 nlus					

CARTRIDGE BRASS, 70% IN ROLLS

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

Half Hard Temper

No. 14	.0641	1 3/4	.412	No. 16	.0508	8	1.49
No. 14	.0641	6	1.41	No. 16	.0508	10	1.86
No. 14	.0641	8	1.88	No. 16	.0508	12	2.24
No. 14	.0641	10	2.35	No. 16	.0508	14	2.62
No. 14	.0641	12	2.82	No. 16	.0508	16	2.98
No. 14	.0641	14	3.29	No. 16	.0508	18	3.36
No. 14	.0641	16	3.76	No. 17	.0453	12	1.99
No. 14	.0641	18	4.24	No. 18	.0403	1/4	.037
	.0600	6	1.32	No. 18	.0403	3/8	.056
No. 16	.0508	3/8	.070	No. 18	.0403	1/2	.074
No. 16	.0508	1/2	.093	No. 18	.0403	5/8	.092
No. 16	.0508	5/8	.117	No. 18	.0403	3/4	.111
No. 16	.0508	3/4	.140	No. 18	.0403	7/8	.130
No. 16	.0508	7/8	.163	No. 18	.0403	1	.148
No. 16	.0508	1	.187	No. 18	.0403	1 1/8	.167
No. 16	.0508	1 1/8	.210	No. 18	.0403	$1 \ 1/4$.185
No. 16	.0508	1 1/4	.233	No. 18	.0403	$1 \ 1/2$.222
No. 16	.0508	$1 \ 1/2$.280	No. 18	.0403	$1 \ 3/4$.259
No. 16	.0508	1 3/4	.327	No. 18	.0403	2	.296
No. 16	.0508	2	.373	No. 18	.0403	21/4	.333
No. 16	.0508	2 1/4	.420	No. 18	.0403	2 1/2	.370
No. 16	.0508	21/2	.466	No. 18	.0403	6	.888
No. 16	.0508	2 11/16	.501	No. 18	.0403	8	1.19
No. 16	.0508	$2 \ 15/16$.558	No. 18	.0403	10	1.48
No. 16	.0508	6	1.12	1			

Continued

Sizes other than listed can be furnished from mill stocks or cut from wider stock.



CARTRIDGE BRASS, 70% IN ROLLS

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

Half Hard Temper Continued

Thickness		Weight Thickness			ckness	Weight		
	Decimal		Lbs. per		Decimal		Lbs. per	
B. & S.	Equivalent	Width	Lin. Ft.	B. & S.	Equivalent	Width	Lin. Ft.	
Gauge	Inches	Inches	(Approx.)	Gauge	Inches	Inches	(Approx.)	
No. 18	.0403	12	1.78	No. 22	.0253	10	.933	
No. 18	.0403	14	2.07	No. 22	.0253	12	1.11	
No. 18	.0403	16	2.36	No. 22	.0253	14	1.30	
No. 18	.0403	18	2.66	No. 22	.0253	16	1.49	
No. 19	.0359	6	.791	No. 22	.0253	18	1.67	
No. 19	.0359	12	1.58	No. 23	.0226	6	.498	
No. 20	.0320	1/4	.029	No. 23	.0226	12	.996	
No. 20	.0320	3/8	.044	No. 24	.0201	1/4	.018	
No. 20	.0320	1/2	.059	No. 24	.0201	3/8	.028	
No. 20	.0320	5/8	.073	No. 24	.0201	1/2	.036	
No. 20	.0320	3/4	.088	No. 24	.0201	5/8	.046	
No. 20	.0320	7/8	.103	No. 24	.0201	3/4	.055	
No. 20	.0320	1	.117	No. 24	.0201	7/8	.066	
No. 20	.0320	1 1/8	.132	No. 24	.0201	1	.074	
No. 20	.0320	$1 \frac{1}{4}$.146	No. 24	.0201	1 1/8	.083	
No. 20	.0320	1 1/2	.176	No. 24	.0201	1 1/4	.092	
No. 20	.0320	$1 \ 3/4$.205	No. 24	.0201	$1 \ 1/2$.110	
No. 20	.0320	2	.235	No. 24	.0201	$1 \ 3/4$.125	
No. 20	.0320	21/4	.264	No. 24	.0201	2	.148	
No. 20	.0320	$2 \ 1/2$.294	No. 24	.0201	21/4	.166	
No. 20	.0320	6	.705	No. 24	.0201	2 1/2	.184	
No. 20	.0320	8	.940	No. 24	.0201	6	.443	
No. 20	.0320	10	1.17	No. 24	.0201	8	.590	
No. 20	.0320	12	1.51	No. 24	.0201	10	.737	
No. 20	.0320	14	1.64	No. 24	.0201	12	.885	
No. 20	.0320	16	1.88	No. 24	.0201	14	1.03	
No. 20	.0320	18	2.11	No. 24	.0201	16	1.18	
No. 21	.0285	6	.635	No. 24	.0201	18	1.32	
No. 21	.0285	12	1.27	No. 25	.0179	6	.394	
No. 22	.0253	1/4	.023	No. 25	.0179	12	.789	
No. 22	.0253	3/8	.035	No. 26	.0159	1/4	.015	
No. 22	.0253	1/2	.047	No. 26	.0159	3/8	.022	
No. 22	.0253	5/8	.058	No. 26	.0159	1/2	.030	
No. 22	.0253	3/4	.070	No. 26	.0159	5/8	.035	
No. 22	.0253	7/8	.082	No. 26	.0159	3/4	.044	
No. 22	.0253	1	.093	No. 26	.0159	1	.058	
No. 22	.0253	1 1/8	.105	No. 26	.0159	1 1/4	.069	
No. 22	.0253	1 1/4	.116	No. 26	.0159	$1 \ 1/2$.087	
No. 22	.0253	$1 \ 1/2$.140	No. 26	.0159	2	.117	
No. 22	.0253	1 3/4	.163	No. 26	.0159	6	.350	
No. 22	.0253	2	.186	No. 28	.0159	8	.467	
No. 22	.0253	21/4	.209	No. 26	.0159	10	.584	
No. 22	.0253	21/2	.233	No. 26	.0159	12	.701	
	0050	6	.558	No. 26	.0159	14	.817	
No. 22	.0253	0	.000	110. 20	.02.00	16	.834	

Continued

For Data, See Page 24, this Section.
Sizes other than listed can be furnished from mill stocks or cut from wider stock.



CARTRIDGE BRASS, 70% IN ROLLS

COPPER ALLOY NO. 260

(Yellow Brass or High Brass)

Half-Hard Temper Continued

Thickness Decimal			Weight Lbs. per	Thi	Thickness			
B. & S. Gauge	Equivalent Inches	Width Inches	Lin. Ft. (Approx.)	B. & S. Gauge	Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)	
No. 26	.0159	18	.938	No. 30	.0100	12	.441	
No. 27	.0142	12	.626	No. 32	.0080	12	.353	
No. 28	.0126	6	.277	No. 34	.0063	12	.264	
No. 28	.0126	8	.370	No. 36	.0050	6	.110	
No. 28	.0126	10	.463	No. 36	.0050	12	.220	
No. 28	.0126	12	.555	No. 38	.0040	6	.088	
No. 30	.0100	6	.220		.0030	6	.066	
No. 30	.0100	8	.294	No. 44	.0020	6	.044	
No. 30	.0100	10	.368	No. 50	.0010	6	.022	

Slitting Stock

For Slitting to Customers' Specifications

Three-Quarter Hard Temper

No. 18	.0403	24	 1	No. 26	.0159	24	

Hard Temper

No. 20 No. 24	.0320	24	 1	No. 26	.0159	24	
No. 24	.0201	24					

CARTRIDGE BRASS, 70% IN ROLLS

COPPER ALLOY NO. 260

(Yellow Brass or High Brass) Hard Temper .066 .003 6 .022 .001 .088 .004 6 .0015 6 .033 .110 .005 6 .002 6 .044 Spring Temper .350 6 1.90 No. 26 .0159No. 14 .0641 8 .471 8 .0641 12 2.82 No. 26 .0159 No. 14 .708 .0508 No. 26 .015912 8 1.50 No. 16 No. 28 8 .373 .0403 .0126 8 1.20 No. 18 .561 No. 28 12 .0403 12 1.80 .0126 No. 18 .296 .949 8 .0320 8 No. 30 .0100 No. 20 No. 30 .0100 12 .445 12 1.52 No. 20 .0320 .237 12 No. 32 .0080 8 No. 21 .0285 1.28 .557 No. 34 .0063 8 .186 No. 22 .0253 6 .751 .222 8 No. 36 .0050 12 No. 22 .0253 No. 36 .0050 6 .111 12 1.12 No. 22 .0253 6 .088 No. 38 .0040 12 .996 No. 23 .0226 .066

For Data, See Page 24, this Section.

. . . No. 44

No. 50

.590

.894

.789

No. 24

No. 24

No. 25

.0201

.0201

.0179

8

12

12

.0030

.0020

.0010

.044

.022

6

6



HIGH LEADED BRASS SHEET AND STRIP

COPPER ALLOY NO. 342 AND NO. 353

CHEMICAL COMPOSITION*

Copper, 63.5%

Zinc. 34.5%

Lead, 2%

High-Leaded Brass, formerly called Engravers' Brass, Clock Brass or Heavy-Leaded Brass, has excellent machinability and fair cold working properties. It can be blanked, machined, pierced, stamped, drilled, tapped, broached and milled. It is used for clock and watch parts, such as plates, backs, frames, gears and wheels; also for hardware, channel plate, key blanks and engraving.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)	Suitability for Being Joined by:
Rating 90	Soft Soldering Excellent
Type of Chip S	Brazing
Capacity for Being Cold Worked Fair	Oxyacetylene Welding Not Recommended
Capacity for Being Hot Formed Poor	Carbon Arc Welding Not Recommended
Hot Forgeability Rating	Gas Shielded Arc Welding Not Recom.
(Forging Brass = 100)	Coated Metal Arc Welding Not Recom.
Hot Working Temperature	Resistance Welding;
Annealing Temperature	Spot Not Recommended
800°-1100°F. or 425°-600°C.	Seam Not Recommended
	Dutt Fair

MECHANICAL PROPERTIES*

7 Censile Strength, p.s.i. 50,000 Shear Strength, p.s.i. 50,000 Shear Strength, p.s.i. 40,000 Elongation, % in 2-in. Rockwell Hardness B70, 30T65

PHYSICAL PROPERTIES*

0.306 8.47 0.0000113 per °F. from 68 F. to 572 F. 67 Btu./sq. ft./ft./hr./°F. @ 68 F. 39.9 Ohms (circ. mil./ft.) @ 68 F. 26 % IACS @ 68 F.

1670

0.09 Btu./lb./°F. @ 68 F. 15,000,000 psi 5,600,000 psi

Liquidus

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M. B121, Alloy 4 and 5

A.M.S.

Federal QQ-B-613b, Comp. 24 and 11

Military MIL-C-895A (Navy)

^{*}All Values nominal. Not to be used as specification requirements.



HIGH-LEADED BRASS SHEET & STRIP

COPPER ALLOY NO. 342 AND NO. 353

HALF HARD TEMPER
In 8 to 12-foot Flat Mill Lengths

Thick- ness Inches	Decimal Equivalent Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Thick- ness Inches	Decimal Equivalent Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
3/4	.750	12	33.0	1/4	.250	10	9.18
5/8	.625	12	27.6	1/4	.250	8	7.34
5/8	.625	6	13.8	1/4	.250	6	5.51
1/2	.500	14	25.7	3/16	.188	14	9.64
1/2	.500	12	22.0	3/16	.188	12	8.26
1/2	.500	10	18.4	3/16	.188	10	6.88
1/2	.500	6	11.0	3/16	.188	8	5.51
3/8	.375	14	19.3	3/16	.188	6	4.13
3/8	.375	12	16.5	No. 5 B. & S	1819	30	20.3
3/8	.375	10	13.8	5/32	.156	12	6.88
3/8	.375	8	11.0	1/8	.125	14	6.43
3/8	.375	6	8.26	1/8	.125	12	5.51
5/16	.312	14	16.1	1/8	.125	10	4.59
5/16	.312	12	13.8	3/32	.0938	12	4.13
1/4	.250	14	12.9	1/16	.0625	12	2.75
1/4	250	12	11.0				

NAVAL BRASS SHEET

COPPER ALLOY NO. 464

In Exact Sizes as Listed

Hot Rolled

Thic	kness		Weight	1	Thic	kness		Weight
Inches &	Decimal	Length,	Lbs.		Inches &	Decimal	Length,	Lbs.
B. & S.	Equivalent	Width	(Approx.)		B. & S.	Equivalent	Width	(Approx.)
Gauge	Inches	Inches	Per Sheet		Gauge	Inches	Inches	Per Sheet
1	1.000	24 x 90	654.		3/8	.375	48 x 120	654.
1	1.000	36 x 72	785.		1/4	.250	24 x 48	87.0
3/4	.750	18 x 72	294.		1/4	.250	24 x 96	174.0
3/4	.750	24 x 96	523.		1/4	.250	48 x 120	436.
3/4	.750	36 x 72	589.		3/16	.188	24 x 48	65.0
5/8	.625	24 x 72	327.		3/16	.188	36 x 96	196.
5/8	.625	24 x 96	436.		1/8	.125	24 x 48	43.0
	.508	16 x 18	44.		1/8	.125	36 x 96	129.
1/2	.500	24 x 48	174.		No. 14	.0641	24 x 48	22.0
1/2	.500	24 x 96	349.		No. 14	.0641	36 x 96	67.0
1/2	.500	48 x 120	872.		No. 20	.0320	24 x 48	11.0
3/8	.375	24 x 48	130.		No. 20	.0320	36 x 96	33.0
3/8	.375	24 x 96	261.	1				
			Col	d Ro	lled			
1/4	.250	36 x 96	262.	1	1/8	.125	36 x 96	131.

For Data, See Page 43, this Section.
Sizes other than listed can be furnished from mill stocks or cut from wider stock.



MUNTZ METAL

COPPER ALLOY NO. 280

CHEMICAL COMPOSITION*

Copper, 62%

Zinc. 38%

Muntz Metal, formerly known as Yellow Metal, Washer Brass, Burr Brass and Check Brass, is widely used in architectural work. It has high strength combined with limited ductility. Hot working properties are extremely good, but cold forming is limited to moderate bending. Commonly used as flat panels, either solid or perforated, kick plates, tanks, heat exchanger plates.

FABRICATION PROPERTIES*

MECHANICAL PROPERTIES* (0.040 in.)

	As Hot Rolled	Half Hard
Tensile Strength, p.s.i.	54,000	70,000
Yield Strength, p.s.i.	21,000	50,000
Shear Strength, p.s.i.	40,000	44,000
Elongation, % in 2-in.	45	10
Poekwell Hardness	E85. 30T49	B75: 30T67

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1650 Density, lbs., per cu. in. @ 68 F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat)	Liquidus 1660 0.303 8.39 0.0000116 per °F. from 68 F. to 572 F. 71 Btu./sq. ft./ft./hr./°F. @ 68 F. 37.0 Ohms (circ. mil./ft.) @ 68 F. 28 % IACS @ 68 F. 0.09 Btu./lb./°F. @ 68 F.
Modulus of Rigidty	5,600,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. A.M.S. Federal

QQ-B-613b, Comp. 11

Military M

MIL-C-895A

*All Values nominal. Not to be used as specification requirements.



MUNTZ METAL SHEET

COPPER ALLOY NO. 280

HOT ROLLED
In Exact Sizes as Listed

Thic	ckness		Weight	I Thic	ckness		Weight
Inches & B. & S.	Decimal Equivalent	Size	Lbs. per Sheet	Inches & B. & S.	Decimal Equivalent	Size	Lbs. per Sheet
Gauge	Inches	Inches	(Approx.)	Gauge	Inches	Inches	(Approx.)
1	1.000	12 x Rand.	349.1	1/2	.500	24 x 48	174.5
7/8	.875	12 x Rand.	305.4	3/8	.375	24 x 48	130.9
3/4	.750	12 x Rand.	261.8	5/16	.312	24 x 48	109.8
3/4	.750	24 x 96	523.6	1/4	.250	24 x 48	87.2
5/8	.625	12 x Rand.	218.2	1/4	.250	36 x 96	261.8
5/8	625	21 v 18	218 2				

COLD ROLLED

Half Hard Temper

			In Exact Si	zes as Listed			
1/2	.500	24 x 48	174.6	No. 12	.0808	36 x 96	84.6
3/8	.375	24 x 48	130.8	No. 14	.0641	24 x 48	22.4
3/8	.375	24 x 96	261.6	No. 14	.0641	24 x 96	44.7
3/8	.375	36 x 96	392.8	No. 14	.0641	30 x 60	34.9
1/4	.250	24 x 48	87.2	No. 14	.0641	30 x 96	55.8
1/4	.250	24 x 96	174.5	No. 14	.0641	36 x 96	67.0
1/4	.250	30 x 60	136.2	No. 14	.0641	48 x 96	89.4
1/4	.250	36 x 96	261.6	No. 16	.0508	24 x 48	17.8
3/16	.188	24 x 48	65.4	No. 16	.0508	24 x 96	35.5
3/16	.188	30 x 60	102.4	No. 16	.0508	30 x 60	27.8
3/16	.188	36 x 96	196.4	No. 16	.0508	36 x 96	53.2
1/8	.125	24 x 48	43.6	No. 17	.0453	24 x 48	15.8
1/8	.125	24×96	87.2	No. 18	.0403	24 x 48	14.0
1/8	.125	30 x 60	68.1	No. 18	.0403	24 x 96	28.1
1/8	.125	30 x 96	109.0	No. 18	.0403	36 x 96	42.2
1/8	.125	36 x 96	130.8	No. 20	.0320	24 x 48	10.2
No. 10	.1019	36 x 96	106.5	No. 20	.0320	24×96	20.3
3/32	.0938	24 x 48	33.0	No. 20	.0320	30 x 60	17.4
3/32	.0938	30 x 60	51.6	No. 20	.0320	30 x 96	27.8
No. 12	.0808	24 x 48	28.2	No. 20	.0320	36 x 96	35.2
	3/8 3/8 3/8 1/4 1/4 1/4 1/4 3/16 3/16 3/16 1/8 1/8 1/8 1/8 1/8 1/8 3/32 3/32	3/8 .375 3/8 .375 3/8 .375 1/4 .250 1/4 .250 1/4 .250 1/4 .250 3/16 .188 3/16 .188 3/16 .188 1/8 .125	3/8 .375 24 x 48 3/8 .375 24 x 96 3/8 .375 36 x 96 1/4 .250 24 x 48 1/4 .250 24 x 96 1/4 .250 30 x 60 1/4 .250 36 x 96 3/16 .188 24 x 48 3/16 .188 30 x 60 3/16 .188 36 x 96 1/8 .125 24 x 48 1/8 .125 24 x 96 1/8 .125 30 x 96 1/8 .125 30 x 96 1/8 .125 36 x 96 No. 10 .1019 36 x 96 3/32 .0938 24 x 48 3/32 .0938 30 x 60	1/2 .500 24 x 48 174.6 3/8 .375 24 x 96 261.6 3/8 .375 24 x 96 261.6 3/8 .375 36 x 96 392.8 1/4 .250 24 x 48 87.2 1/4 .250 24 x 96 174.5 1/4 .250 30 x 60 136.2 1/4 .250 36 x 96 261.6 3/16 .188 24 x 48 65.4 3/16 .188 30 x 60 102.4 3/16 .188 36 x 96 196.4 1/8 .125 24 x 48 43.6 1/8 .125 24 x 96 87.2 1/8 .125 30 x 60 68.1 1/8 .125 30 x 96 109.0 1/8 .125 36 x 96 130.8 No. 10 .1019 36 x 96 106.5 3/32 .0938 34 x 48 33.0 3/32 .0938 30 x 60 51.6	3/8 .375 24 x 48 130.8 No. 14 3/8 .375 24 x 96 261.6 No. 14 3/8 .375 36 x 96 392.8 No. 14 1/4 .250 24 x 48 87.2 No. 14 1/4 .250 24 x 96 174.5 No. 14 1/4 .250 30 x 60 136.2 No. 14 1/4 .250 36 x 96 261.6 No. 14 1/4 .250 36 x 96 261.6 No. 14 3/16 .188 24 x 48 65.4 No. 16 3/16 .188 30 x 60 102.4 No. 16 3/16 .188 36 x 96 196.4 No. 16 1/8 .125 24 x 48 43.6 No. 17 1/8 .125 24 x 96 87.2 No. 18 1/8 .125 30 x 96 109.0 No. 18 1/8 .125 30 x 96 109.0 No. 18 1/8 .125 36 x 96 130.8 No. 20 No. 10 .1019	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1/2 .500 24 x 48 174.6 No. 12 .0808 36 x 96 3/8 .375 24 x 96 261.6 No. 14 .0641 24 x 96 3/8 .375 24 x 96 261.6 No. 14 .0641 24 x 96 3/8 .375 36 x 96 392.8 No. 14 .0641 30 x 60 1/4 .250 24 x 48 87.2 No. 14 .0641 30 x 60 1/4 .250 24 x 96 174.5 No. 14 .0641 36 x 96 1/4 .250 30 x 60 136.2 No. 14 .0641 48 x 96 1/4 .250 36 x 96 261.6 No. 16 .0508 24 x 48 3/16 .188 24 x 48 65.4 No. 16 .0508 24 x 96 3/16 .188 36 x 96 196.4 No. 16 .0508 36 x 96 1/8 .125 24 x 48 43.6 No. 17 .0453 24 x 48 1/8 .125 24 x 96 87.2 No. 18 .0403 24 x 48 1

MANGANESE BRONZE SHEET

COPPER ALLOY NO. 675

COLD ROLLED
In Exact Sizes as Listed

Sizes other than listed can be furnished from mill stocks or cut from wider stock.



RED BRASS, 85% SHEET AND STRIP

COPPER ALLOY NO. 230

CHEMICAL COMPOSITION*

Copper, 85%

Zinc, 15%

Red Brass, 85% is perhaps the most widely used of the low-zinc brasses. It has a rich golden color and the excellent cold working properties of the "alpha" brasses, and can stand severe cold drawing. It is readily stamped or spun, but hot working is limited by a narrow temperature range. It is highly corrosion resistant—in some cases more so than copper. Uses include builders' hardware, weatherstripping, fire extinguisher cases, watch and clock dials, coins and plaques, costume jewelry, vanity cases, lipstick containers, zipper sliders and ball pen caps.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing Excellent Oxyacetylene Welding Good Carbon Arc Welding Fair Gas Shielded Arc Welding Not Recom. Resistance Welding: Spot Fair Seam Not Recommended Butt Good
600 -1350 F. 01 420 -415 C.	Dutt

MECHANICAL PROPERTIES* (all 0.040 gauge strip)

	0.035 mm Annealed	Hard (37%)	Half-Hard
Tensile Strength, p.s.i.	41,000	70,000	57,000
Yield Strength, p.s.i.	14,000	57,000	49,000
Shear Strength, p.s.i.	31,000	42,000	37,000
Elongation, % in 2-in.	46	5	12
Rockwell Hardness	63 30T22	B77. 30T68	B65, 30T60

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1810	Liquidus 1880
,	
Density, lbs., per cu. in. @ 68 F.	0.316
Specific gravity	8.75
Coefficient of Thermal Expansion	0.0000104 per °F. from 68 F. to 572 F.
Thermal Conductivity	92 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	28 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	37 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.09 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	17,000,000 psi
Modulus of Rigidity	6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M.	79A B36, Alloy 3
A.M.S.	
Federal	QQ-B-613b, Comp.
Military	

^{*}All Values nominal. Not to be used as specification requirements.



2.88

12

RED BRASS 85% SHEET

COPPER ALLOY NO. 230

(formerly called Rich Low Brass)

SOFT TEMPER In Flat 8 to 10-foot Mill Lengths

Thickness			Weight	Thic	kness		Weight
Inches & B. & S.	Decimal Equivalent	Width	Lbs. per Lin. Ft.	Inches & B. & S.	Decimal Equivalent	Width	Lbs. per Lin. Ft.
Gauge	Inches	Inches	(Approx.)	Gauge	Inches	Inches	(Approx.)
No. 11	.0907	12	4.12	No. 18	.0403	12	1.83
No. 12	.0808	12	3.67	No. 20	.0320 .0201	12 12	1.56 .916
No. 14 No. 16	.0641	12 12	2.88 2.32	No. 24 No. 26	.0159	12	.720
140. 10	.0000		2.02		••••		
			HALF HAR	D TEMPER			
		In	Flat 8 to 10-:	foot Mill Leng	gths		

RED BRASS 85%, IN ROLLS

No. 14

.0641

5.68

4.12

12

12

.1250

1/8

No. 11

COPPER ALLOY NO. 230

(formerly called Rich Low Brass)

			DEAD SO	FT T	EMPER			
No. 14	.0641	6	1.44	1	No. 18	.0403	6	.915
No. 16	.0508	6	1.16	-	No. 20	.0320	6	.780
			SOFT	TEM	PER			
No. 10	.1019	6	2.32	1	No. 21	.0285	6	.647
No. 11	.0907	6	2.06	1	No. 22	.0253	6	.574
No. 12	.0808	8	2.45	- 1	No. 23	.0226	6	.513
No. 13	.0720	6	1.64	- 1	No. 23	.0226	61/4	.534
No. 14	.0641	6	1.44		No. 24	.0201	6	.458
No. 15	.0571	6	1.30		No. 25	.0179	6	.406
No. 16	.0508	6	1.16	1	No. 26	.0159	6	.360
No. 17	.0453	4 3/16	.713	- 1	No. 27	.0142	6	.322
No. 17	.0453	6	1.03	- 1	No. 28	.0126	6	.286
No. 18	.0403	6	.915		No. 30	.0100	3 1/8	.118
No. 19	.0359	6	.814		No. 30	.0100	6	.226
No. 20	.0320	6	.780		No. 32	.0080	6	.181
No. 21	.0285	4 1/2	.486	1				
			QUARTER	HARI	TEMPER	3		
No. 22	.0253	6	.574	i	No. 24	.0201	6	.458
			HALF HA	ARD T	EMPER			
No. 18	.0403	6	.915		No. 24	.0201	6	.458
No. 22	.0253	6	.574		No. 26	.0159	6	.360
	,0200		*					
			HARD	TEM	IPER			
No. 26	.0159	6	.360	1				



COMMERCIAL BRONZE, 90% SHEET AND STRIP

COPPER ALLOY NO. 220

CHEMICAL COMPOSITION*

Copper, 90%

Zinc. 10%

Commercial Bronze, 90% is technically a true brass, but its name is derived from its typical bronze color. It has excellent cold working properties and is well suited to spinning and drawing. It is stronger and harder than copper, but does not machine freely. It has good resistance to stress corrosion and season cracking. Used for store fronts, builders' hardware, outdoor light fixtures, weatherstripping, compacts, lipstick cases and costume jewelry.

FABRICATION PROPERTIES*

MECHANICAL PROPERTIES* (all 0.040 gauge strip)

	Quarter Hard	Half Hard
Tensile Strength, p.s.i.	45,000	52,000
Yield Strength, p.s.i.	35,000	45,000
Shear Strength, p.s.i.	33,000	35,000
Elongation, % in 2-in.	25	11
Rockwell Hardness	B42, 30T44	B58, 30T56

PHYSICAL PROPERTIES*

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.
A.S.T.M.
A.M.S.
Federal
Military

JAN-G-383

^{*}All Values nominal. Not to be used as specification requirements.



COMMERCIAL BRONZE 90% SHEET

COPPER ALLOY NO. 220

QUARTER HARD TEMPER

Dry Rolled In Exact Sizes as Listed

Thickness			Weight	1	Thic	kness		Weight
Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)		Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)
No. 16 No. 16	.0508	3 5/8 x 144 8 x 144	8.4 18.6		No. 16 No. 16	.0508	10 x 144 12 x 144	23.3 27.9

HALF HARD TEMPER In 6 to 8-foot Flat Mill Lengths

1/4	.250	12	11.43	No. 18	.0403	10	1.54
1/8	.125	8	3.82	No. 18	.0403	12	1.85
1/8	.125	12	5.73	No. 18	.0403	16	2.48
No. 11	.0907	12	4.16	No. 20	.0320	12	1.47
No. 14	.0641	8	1.96	No. 20	.0320	16	1.96
No. 14	.0641	10	2.44	No. 22	.0253	12	1.15
No. 14	.0641	12	2.93	No. 26	.0159	12	.729
No. 14	.0641	16	3.91				

RESQUARED AND LEVELLED In Exact Sizes as Listed

No. 26	.0159	9×120	5,5	1	 	

GILDING METAL, 95% STRIP

COPPER ALLOY NO. 210

SOFT TEMPER In 6 to 8-foot Flat Mill Lengths

Thic	kness		Weight	Thic	kness		Weight
Inches &	Decimal		Lbs. per	Inches &	Decimal		Lbs. per
B. & S.	Equivalent	Width	Lin. Ft.	B. & S.	Equivalent	Width	Lin. Ft.
Gauge	Inches	Inches	(Approx.)	Gauge	Inches	Inches	(Approx.)
No. 13	.0720	12	3.33	No. 14	.0641	12	2.96
			IN R	OLLS			
No. 12	.0808	6	1.87	No. 17	.0453	6	1.05
No. 14	.0641	6	1.48	No. 17	.0453	12	2.10
No. 16	.0508	6	1.18	No. 20	.0320	6	.740

For Data, See Following Page.
Sizes other than listed can be furnished from mill stocks
or cut from wider stock.



GILDING, 95% SHEET AND STRIP

COPPER ALLOY NO. 210

(For Stock Listings, See Preceding Page.)

CHEMICAL COMPOSITION*

Copper, 95%

Zinc, 5%

Gilding, 95% is used chiefly for its color—a rich bronze shade. It has excellent cold working properties and can be spun and drawn. It is an excellent base for subsequent vitreous enameling, plating or finishing and is, consequently, widely used for costume jewelry, coins, medals, emblems, plaques, and as a base for gold plate. Also used for primer caps, bullet jackets and small arms ammunition.

FABRICATION PROPERTIES*

MECHANICAL PROPERTIES*

0.040 (0.035 mm Annealed)

Tensile Strength, p.s.i. 35,000
Yield Strength, p.s.i. 11,000
Shear Strength, p.s.i. 28,000
Elongation, % in 2-in. 45
Rockwell Hardness F52

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus Liquidus 1950 Density, lbs., per cu. in. @ 68 F. 0.320 Specific gravity 8.86 0.0000100 per °F. from 68 F. to 572 F. Coefficient of Thermal Expansion 135 Btu./sq. ft./ft./hr./°F. @ 68 F. Thermal Conductivity 18.5 Ohms/circ. mil./ft.) @ 68 F. Electrical Resistivity (Annealed) 56 % IACS @ 68 F. Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) 0.09 Btu./lb./°F. @ 68 F. 17,000,000 psi Modulus of Elasticity (Tension) 6,400,000 psi Modulus of Rigidity

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.
A.S.T.M.
A.M.S.
Federal
Military

B36, Alloy 1

JAN-G-439

*All Values nominal. Not to be used as specification requirements.

42. BRASS & BRONZE



NAVAL BRASS SHEET

COPPER ALLOY NO. 464

(For Stock Listings, See Page 35, this Section.)

CHEMICAL COMPOSITION*

Copper, 60.5%

Zinc. 38.75%

Tin. 0.75%

Naval Brass is a high strength, corrosion resistant alloy available at a comparatively low cost. It is widely specified for tube sheets and support plates in heat exchangers and steam condensers.

FARRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing Excellent Oxyacetylene Welding Good Carbon Arc Welding Fair Gas Shielded Arc Welding Fair Coated Metal Arc Welding Not Recom. Resistance Welding: Spot Good Seam Fair
Annealing Temperature	Seam Fair Butt

MECHANICAL PROPERTIES* (As Hot Rolled)

	1.0 inch
Tensile Strength, p.s.i.	55,000
Yield Strength, p.s.i.	25,000
Shear Strength, p.s.i.	40,000
Elongation, % in 2-in.	50
Rockwell Hardness	B55, 30T-55

PHYSICAL PROPERTIES*

0.304 8.41 0.0000118 per °F. from 68 F. to 572 F. 67 Btu./sq. ft./ft./hr./°F. @ 68 F. 39.9 Ohms (circ. mil./ft.) @ 68 F. 26 % IACS @ 68 F.

1650

0.09 Btu./lb./°F. @ 68 F. 15.000.000 psi

Liquidus

15,000,000 psi 5,600,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M. B171

A.M.S.

Federal QQ-B-613b, Comp. 11 or QQ-B-639

Military B994C or MIL-C895A

^{*}All Values nominal. Not to be used as specification requirements.



PHOSPHOR BRONZE, 5% (A) STRIP

COPPER ALLOY NO. 510

CHEMICAL COMPOSITION*

Copper, 95%

Tin. 4.75%

Phosphorus, 0.25%

Phosphor Bronze, 5% (A) is suitable for ordinary forming, bending, stamping and moderate deep drawing. Its high resiliency and resistance to permanent set make it the generally accepted alloy for corrosion resistant springs. It is used for bearings, springs, switch parts, diaphragms, bellows, fuse clips, electrical contacts, and fasteners.

FABRICATION PROPERTIES*

Hot Forgeability Rating (Forging Brass = 100). — Hot Working Temperature. — Annealing Temperature. — 900°-1250°F. or 475°-675°C. Gas Shielded Arc Welding	Hot Working Temperature — Annealing Temperature	Resistance Welding: Spot
--	---	--------------------------

MECHANICAL PROPERTIES* (0.040 Gauge Strip)

Tensile Strength, p.s.i. 100,000
Yield Strength, p.s.i. 80,000
Shear Strength, p.s.i. —
Elongation, % in 2-in. 4
Rockwell Hardness B95, 30T79

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1750
Density, lbs., per cu. in. @ 68 F.
Specific gravity
Coefficient of Thermal Expansion
Thermal Conductivity
Electrical Resistivity (Annealed)
Electrical Conductivity (Annealed)
Thermal Capacity (Specific Heat)
Modulus of Elasticity (Tension)
Modulus of Rigidity

Liquidus <u>1920</u> 0.320

8.86 0.0000099 per °F. from 68 F. to 572 F. 40 Btu/sq. ft./ft./hr./°F. @ 68 F. 69.1 Ohms (circ. mil./ft.) @ 68 F. 15 % IACS @ 68 F. 0.09 Btu./lb./°F. @ 68 F. 16.000.000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

6.000,000 psi

S.A.E. 77A A.S.T.M. <u>B103</u> A.M.S. 4510C Federal <u>QQ-B-750</u>, Type A Miltary MIL-W-16602

^{*}All Values nominal. Not to be used as specification requirements.



PHOSPHOR BRONZE 5% (A) STRIP

COPPER ALLOY NO. 510

In Flat Lengths, about 6 Feet

SPRING TEMPER

Thic	kness		Weight	Thic	kness		Weight
Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)	Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)
1/8	.125	6	2.89	No. 22	.0253	6	.583
No. 11	.0907	6	2.10	No. 24	.0201	6	.465
No. 12	.0808	6	1.87	No. 26	.0159	6	.369
No. 14	.0641	6	1.48	No. 28	.0126	6	.292
No. 16	.0508	6	1.18	No. 30	.0100	6	.231
No. 17	.0453	6	1.05	No. 32	.0080	6	.185
No. 18	.0403	6	.932	No. 34	.0063	6	.146
No. 20	.0320	6	.740	No. 36	.0050	6	.116

HARD TEMPER

3/16 .1875 12 8.65 |

PHOSPHOR BRONZE 5% (A) IN ROLLS

COPPER ALLOY NO. 510

SPRING TEMPER

No. 14	.0641	8	1.961	No. 26	.0159	6	.369
No. 16	.0508	8	1.554	No. 26	.0159	8	.487
No. 18	.0403	6	.932	No. 27	.0142	6	.328
No. 18	.0403	8	1.233	No. 28	.0126	6	.292
No. 20	.0320	6	.740	No. 28	.0126	8	.386
No. 20	.0320	8	.979	No. 30	.0100	6	.231
No. 21	.0285	6	.667	No. 30	.0100	8	.306
No. 22	.0253	6	.583	No. 32	.0080	6	.185
No. 22	.0253	8	.774	No. 32	.0080	8	.245
No. 23	.0226	6	.523	No. 34	.0063	6	.146
No. 24	.0201	6	.465	No. 34	.0063	8	.193
No. 24	.0201	8	.615	No. 36	.0050	6	.116
No. 25	.0179	6	.413	No. 36	.0050	8	.157

Sizes other than listed can be furnished from mill stocks or cut from wider stock.



OLYMPIC BRONZE SHEET, TYPE A

(High Silicon Bronze)

COPPER ALLOY NO. 655

CHEMICAL COMPOSITION*

Copper, 96%

Silicon, 3%

Manganese, 1%

Olympic Bronze Strip, Type A, is a high-silicon bronze, used for tanks, vats and kettles, chemical equipment and marine and other hardware. Its combination of high strength, corrosion resistance and excellent welding characteristics makes it the right selection for many engineered pressure applications. It can be fabricated by blanking, drawing, forming and bending, heading and upsetting, hot forging and pressing, shearing, squeezing and swaging.

FABRICATION PROPERTIES*

MECHANICAL PROPERTIES* (0.040" gauge)

Tensile Strength, p.s.i.	56,000
Yield Strength, p.s.i.	21,000
Shear Strength, p.s.i.	42,000
Elongation, % in 2-in.	63
Rockwell Hardness	F76, B40

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1780	Liquidus 1880
Density, lbs., per cu. in. @ 68 F.	0.308
Specific gravity	8.53
Coefficient of Thermal Expansion	0.0000100 per °F. from 68 F. to 572 F.
Thermal Conductivity	21 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	148 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	7.0 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.09 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	15,000,000 psi
Modulus of Rigidity	5,600,000

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M. B96, Type A; B97, Alloy A; B100, Alloy 2

A.M.S.

Federal QQ-C-591c, Comp. A

Military MIL-C-1751b (Navy) Comp. 1

^{*}All Values nominal. Not to be used as specification requirements.



OLYMPIC BRONZE SHEET

COPPER ALLOY NO. 655

(High Silicon Bronze A)

TYPE "A"-HOT ROLLED In Exact Sizes as Listed

Thic	kness		Weight	Thic	kness		Weight
Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)	Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Lbs. per Lin. Ft. (Approx.)
1/4	.250	36 x 120	33.32	No. 14	.0641	36 x 120	8.52
3/16	.188	36 x 120	25.04	No. 18	.0403	36 x 96	5.38
1/8	.125	36 x 120	16.68	No. 18	.0403	36 x 120	5.38

NICKEL SILVER 18% SHEET

GRADE A SOFT TEMPER

COPPER ALLOY NO. 752

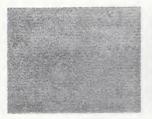
In Flat 8-foot Mill Lengths

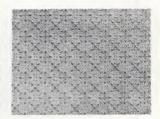
1/8	.125	8	3.79	No. 20	.0320	8	.97
No. 16	.0508	8	1.54	No. 24	.0201	8	.61
NTO 10	0403	0	1 99	1			

Sizes other than listed can be furnished from mill stocks or cut from wider stock.



CHASE EMBOSSED SHEET METAL



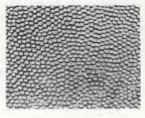


Pebble

Frosted

Arabesque







Basket Weave

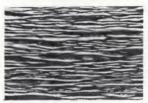
Hammered One Side

Hammered Both Sides

Chase Embossed Sheet Metal is now being used for building hardware, all kinds of metal novelties, clocks, automobile trim, decorative metal edgings, and many other products.

The six standard patterns of Chase Embossed Sheet Metal are illustrated above, and are available in Brass, Copper and Bronze. The maximum widths, and minimum and maximum gauges in which each pattern can be furnished are listed below.

Pattern	Widths	Gauges
Pebble	Up to 6''	From .012 to .040
Frosted	Up to 7 1/4"	From .0159 to .040
Arabesque	Up to 6''	From .012 to .040
Basket Weave	Up to 8''	From .012 to .040
Hammered One Side	Up to 8''	From .020 to .040
Hammered Both Sides	Up to 8''	From .020 to .040



R-1-CS

R-1-CS

36" x 96"

16 oz.



FOR BRASS & BRONZE SHEET & STRIP-COLD ROLLED

With Slit. Slit and Edge Rolled, Sheared, Sawed or Machined Edges

STANDARD THICKNESS TOLERANCES (In Inches)

Not applicable to Condenser Tube Plates, A.S.M.E. Code Tank Plates and Sheets, Flat Products with Rolled (not previously slit) or Drawn Edges.

The following tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.

NON-REFRACTORY ALLOYSa

	NON-	REFRACIO	ALI ALLOIL	,		
			Width i	n Inches		
military to the second	Up to	Over 8	Over 12	Over 14	Over 20	Over 28
Thickness in Inches	8	to	to	to	to	to
	incl.	12 incl.	14 incl.	20 incl.	28 incl.	36 incl.
Up to .004 incl.	.0003	.0006	.0006			
Over .004 to .006 incl.	.0004	.0008	.0008	.0013		
Over .006 to .009 incl.	.0006	.0010	.0010	.0015		
Over .009 to .013 incl.	.0008	.0013	.0013	.0018	.0025	.003
Over .013 to .017 incl.	.0010	.0015	.0015	.002	.0025	.003
Over .017 to .021 incl.	.0013	.0018	.0018	.002	.003	.0035
Over .021 to .026 incl.	.0015	.002	.002	.0025	.003	.0035
Over .026 to .037 incl.	.002	.002	.002	.0025	.0035	.004
Over .037 to .050 incl.	.002	.0025	.0025	.003	.004	.005
Over .050 to .073 incl.	.0025	.003	.003	.0035	.005	.006
Over .073 to .130 incl.	.003	.0035	.0035	.004	.006	.007
Over .130 to .188 incl.	.0035	.004	.004	.0045	.007	.008
Over .188 to .205 incl.	.0035	.004	.004	.0045	.007	.008
Over .205 to .300 incl.	.004	.0045	.0045	.005	.009	.010
Over .300 to .500 incl.	.0045	.005	.005	.006	.012	.013
Over .500 to .750 incl.	.0055	.007	.007	.009	.015	.017

^aNON-REFRACTORY ALLOYS: Cartridge Brass, 70%; Red Brass, 85%; Commercial Bronze, 90%; Gilding, 95%; High-Leaded Brass.

REFRACTORY ALLOYSb

	102					
			Width i	n Inches		
Thickness in Inches	Up to	Over 8 to	Over 12 to	Over 14 to	Over 20 to	Over 28 to
	incl.	12 incl.	14 incl.	20 incl.	28 incl.	36 incl.
Up to .004 incl.	.0004	.0008	.0008			
Over .004 to .006 incl.	.0006	.0010	.0010	.0015		
Over .006 to .009 incl.	.0008	.0013	.0013	.002		
Over .009 to .013 incl.	.0010	.0015	.0015	.0025		
Over .013 to .017 incl.	.0013	.002	.002	.0025		
Over .017 to .021 incl.	.0015	.0025	.0025	.003		
Over .021 to .026 incl.	.002	.0025	.0025	.003	.004	.005
Over .026 to .037 incl.	.0025	.003	.003	.0035	.005	.006
Over .037 to .050 incl.	.003	.0035	.0035	.004	.006	.007
Over .050 to .073 incl.	.0035	.004	.004	.0045	.007	.008
Over .073 to .130 incl.	.004	.0045	.0045	.005	.008	.010
Over .130 to .188 incl.	.0045	.005	.005	.006	.010	.012
Over .188 to .205 incl.	.0045	.005	.005	.006	.010	.012
Over .205 to .300 incl.	.005	.006	.006	.007	.012	.014
Over .300 to .500 incl.	.006	.007	.007	.008	.015	.017
Over .500 to .750 incl.	.008	.010	.010	.012	.019	.021

brefractory Alloys: Muntz Metal; Naval Brass; Manganese Bronze; Nickel Silver, 18%, Phosphor Bronze, 5% (A); Olympic Bronze.

TOLERANCES

FOR BRASS & BRONZE SHEET & STRIP

With Slit, Slit and Edge Rolled, Sheared or Sawed Edges
LENGTH TOLERANCES-FLAT STRAIGHT LENGTHS
In Inches

Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges, or Condenser Tube Plates.

TABLE I-SPECIFIC LENGTHS AND SPECIFIC LENGTHS WITH ENDS

Tolerances are all plus. If all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given. For Length Tolerances for Square Sheared and for Sawed Metal, see Table III, below, and Table I, following page.

Lengths	Applicable Only to Full Length Pieces
Specific Lengths, up to 10' inclusive	1/4
over 10' to 20' inclusive	1/2
Specific Lengths with Ends	1

SLIT METAL-WIDTH TOLERANCES-IN INCHES

For Metal Furnished in Flat Straight Lengths, in Rolls, or Spooled

The following width tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given. Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges or Condenser Tube Plates.

TABLE II-SLIT METAL AND SLIT METAL WITH ROLLED EDGES

The change in width resulting from edge rolling of metal previously slit is negligible, and therefore the width tolerances for slit metal and for slit metal with rolled edges are the same.

		Thickness	s in Inches	
Width in Inches	.004 to .032 incl.	Over .032 to .125 incl.	Over .125 to .188 incl.	Over .188 to .500 incl.
Up to 2 incl Over 2 to 8 incl Over 8 to 20 incl	.005 .008 1/64	.010 .013 1/64	.012 .015 1/64	.015 .015 1/32

SQUARE SHEARED METAL-LENGTH AND WIDTH TOLERANCES—In Inches Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges.

TABLE III-ALL LENGTHS AND WIDTHS UP TO 10 FEET, INCLUSIVE

The following length and width tolerances are plus and minus: if tolerances are desired all plus or all minus, double the values given.

***********		Thickness in Inches	
Length or Width in Inches	Up to 1/16 incl.	Over 1/16 to 1/8 incl.	Over 1/8
Up to 20 incl Over 20 to 36 incl Over 36 to 120 incl	1/32 3/64 1/16	3/64 3/64 1/16	1/16 1/16 1/16



TOLFRANCES

FOR BRASS & BRONZE SHEET & STRIP-COLD OR HOT ROLLED

TABLE I-LENGTH AND WIDTH TOLERANCES-In Inches-SAWED METAL
Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges.

	Length	Plus	n Tolerances and Minus** n Inches	
Width in Inches	Tolerances All Plus*	For Leng up to 10'		For Lengths over 10'
пспев	In Inches	For Thicknesses up to 1 1/2" incl.	For Thicknesses over 1 1/2''	All Thicknesses
Up to 12 wide, incl Over 12 to 120 wide, incl	1/4 1/4	1/32 1/16	1/16 1/16	1/16 1/16

^{*}These length tolerances are all plus; if all minus tolerances are desired, use the same values: if tolerances are desired plus and minus, halve the values given.

STRAIGHTNESS TOLERANCES—In Inches

Flat Products (Cold or Hot Rolled)

With Slit, Slit and Edge Rolled, Sheared or Sawed Edges

Applicable to any longitudinal surface or edge of material supplied in nominally flat straight lengths and to any longitudinal edge of material supplied in rolls.

Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges.

Maximum Edgewise Curvature (depth of arc) in any 6 foot portion of the Total Length.

TABLE II-SLIT METAL AND SLIT METAL WITH ROLLED EDGES

		Slit Metal	
Width in Inches		Slit nly	As Slit and Either Straightened or Edge Rolled
	Shipped in Rolls	Shipped Flat	Shipped Flat, in Rolls or on Bucks
Over 1/4 to 3/8 incl Over 3/8 to 1/2 incl Over 1/2 to 1 incl Over 1 to 2 incl Over 2 to 4 incl Over 4	2 1 1/2 1 5/8 1/2 3/8	1 1/2 1 3/4 5/8 1/2 3/8	1/2 1/2 1/2 3/8 3/8 3/8

TABLE III—SQUARE SHEARED METAL— Flat Straight Lengths

Not applicable to metal over 10 feet long.

	Width in Inches			
Thickness in Inches	Up to 10 incl.	Over 10		
Up to 1/8 incl Over 1/8 to 3/16 incl Over 3/16	1/16 1/8 1/8	1/32 3/64 1/16		

TABLE IV-SAWED METAL-Flat Straight Lengths

Not applicable to metal over 12 feet long.

nches
Over 3
3/64

^{**}These width tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.



TOLERANCES

OLYMPIC BRONZE TYPE A A.S.M.E. CODE TANK PLATES AND SHEETS

(Both Hot and Cold Rolled)

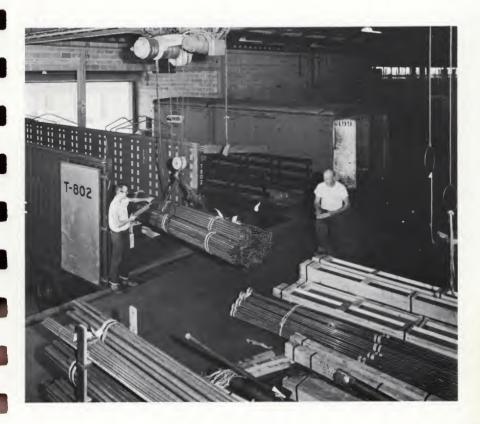
LOT OVERWEIGHT TOLERANCES
In Percentage of Theoretical Weight

	Width in Inches					
Thickness in Inches	Up to 48 incl.	Over 48 to 60 incl.	Over 60 to 72 incl.	Over 72 to 96 incl.	Over 96 to 120 incl.	Over 120 to 132 incl.
Incl. 1/8 to 3/16 incl	6 1/2	8	9	11		
Over 3/16 to 1/4 incl	6 1/2 6 1/2	8 7 3/4	9 8 3/4	11 11	12 12	13
Over 1/4 to 5/16 incl Over 5/16 to 3/8 incl	6 1/4	7 1/2	8 1/2	11	12	13
Over 3/8 to 7/16 incl	6	7 1/4	8 1/4	11	12	13
Over 7/16 to 1/2 incl	6	7	8	10	11	12
Over 1/2 to 5/8 incl	5 3/4	6 1/2	7 1/2	9	10	11
Over 5/8 to 3/4 incl	5 1/2	6	7	8	9	10
Over 3/4 to 1 incl	5	5	6 1/4	7	8	9 8
Over 1 to 2 incl	3 1/2	4	5	6	7	8

Applicable only to Olympic Bronze Type A Tank Plates and Sheets:

Minus Thickness Tolerance: The thickness of any plate or sheet shall not be more than 0.01 inch under the thickness specified.





SEAMLESS BRASS & BRONZE TUBE

BUTTER STIME

Chase Metals Service stocks seamless brass and bronze tube in many types, alloys, shapes and sizes. Round, square, rectangular and round reeded tube are carried in stock, and chromium-plated tube, waveguide tube and condenser and heat exchanger tube, as well. Well-rounded stocks provide wide selection of gauges in standard sizes from 1/8" to 10 1/4" in diameter. The range of

alloys, sizes and gauges, is such as to provide from stock almost any requirement of industrial tube.

Tube up to 14" in diameter, and many specials such as pattern tube or tubes of other shapes or alloys are available on order, usually with excellent delivery possible.

Your inquiries are invited. Call your nearest Chase Metals Service Division.



CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

CHEMICAL COMPOSITION*

Copper, 70%

Zinc. 30%

Cartridge Brass, 70% has excellent tensile strength and is very ductile, possessing the highest combination of these properties of the entire series of copper-zinc alloys. It withstands severe cold working in drawing, spinning, bending and flaring. It is ideally suited for lamp bases, lighting fixtures, musical instruments, plumbers brass goods, traps, tailpieces, surgical instruments, jets, nozzles, railings and furniture.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering
Annealing Temperature	ButtGood

MECHANICAL PROPERTIES* (1.0 x 0.049)

	0.050 mm Anneal	Hard (35%)
Tensile Strength, p.s.i.	47,000	78,000
Yield Strength, p.s.i.	15,000	64,000
Shear Strength, p.s.i.	33,000	44,000
Elongation, % in 2-in.	65	8
Rockwell Hardness	F64, 30T26	B82, 30T73

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1680	Liquidus 1750
Density, lbs., per cu. in. @ 68 F.	0.308
Specific gravity	8.53
Coefficient of Thermal Expansion	0.0000111 per °F. from 68°F to 572°F.
Thermal Conductivity	70 Btu/sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	37 Ohms (circ. mil./ft.)@ 68 F.
Electrical Conductivity (Annealed)	28 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.09 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	16,000,000 psi
Modulus of Rigidity	6,000,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	74C
A.S.T.M.	B135, Alloy 2
A.M.S.	4555C
Federal	
Military	MIL-T-6945, Comp. II

^{*}All Values nominal. Not to be used as specification requirements.



SEAMLESS CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

ROUND-GENERAL PURPOSE TEMPER In 12 to 14-foot Mill Lengths

			III 12 to 14-100	t will benguna	•	
}	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)
	1/8 1/8 1/8 5/32 3/16	.032 .025 .016 .016	.034 .029 .020 .026 .079	7/16 7/16 7/16 7/16 1/2	.035 .032 .025 .020 .125	.163 .150 .119 .097 .543
	3/16 3/16 3/16 3/16 3/16	.040 .032 .028 .025	.068 .058 .052 .047	1/2 1/2 1/2 1/2 1/2	.083 .065 .064 .049	.401 .327 .327 .256 .223
	3/16 7/32 7/32 1/4 1/4	.016 .032 .016 .065	.032 .069 .038 .139	1/2 1/2 1/2 1/2 1/2	.040 .032 .028 .025 .020	.213 .173 .153 .137
	1/4 1/4 1/4 1/4 1/4	.042 .040 .035 .032	.101 .097 .087 .081	9/16 9/16 9/16 9/16 9/16	.065 .049 .042 .040 .032	.374 .291 .253 .242 .196
	1/4 1/4 9/32 5/16 5/16	.025 .016 .016 .065	.065 .043 .049 .186 .149	9/16 5/8 5/8 5/8 5/8	.025 .125 .120 .083 .065	.156 .723 .704 .520
	5/16 5/16 5/16 5/16 5/16	.042 .040 .035 .032	.131 .126 .113 .104 .092	5/8 5/8 5/8 5/8 5/8	.064 .049 .042 .040	.421 .327 .283 .271
	5/16 5/16 3/8 3/8 3/8	.025 .016 .125 .065 .049	.083 .055 .363 .233	5/8 5/8 5/8 11/16 11/16	.028 .025 .020 .065 .040	.193 .174 .140 .469
	3/8 3/8 3/8 3/8 3/8 3/8	.042 .040 .035 .032 .028	.162 .155 .138 .127 .112	11/16 11/16 3/4 3/4 3/4 3/4	.032 .020 .125 .065 .064	.243 .155 .904 .515 .514
	3/8 3/8 7/16 7/16 7/16 7/16	.020 .016 .065 .064 .049	.082 .066 .280 .280 .220	3/4 3/4 3/4 3/4 3/4	.049 .042 .040 .035 .032	.397 .344 .329 .290 .266 .210

Continued



SEAMLESS CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

ROUND-GENERAL PURPOSE TEMPER
In 12 to 14-foot Mill Lengths

Continued

Continued							
O. D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	O. D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)		
3/4 3/4 13/16 13/16 13/16	.020 .018 .065 .042 .032	.169 .152 .562 .375 .289	1 3/8 1 3/8 1 3/8 1 3/8 1 3/8	.083 .065 .045 .042	1.24 .985 .693 .652 .497		
7/8 7/8 7/8 7/8 7/8	.125 .065 .058 .049	1.08 .609 .548 .468 .387	1 3/8 1 1/2 1 1/2 1 1/2 1 1/2	.025 .125 .095 .083 .065	.391 1.98 1.54 1.36 1.08		
7/8 7/8 7/8 7/8 7/8	.035 .032 .025 .020	.340 .312 .246 .198 .181	1 1/2 1 1/2 1 1/2 1 1/2 1 1/2	.057 .049 .040 .035 .032	.960 .823 .676 .593		
15/16 15/16 15/16 1 1	.125 .065 .032 .125	1.18 .656 .335 1.26 .703	1 1/2 1 9/16 1 5/8 1 5/8 1 5/8	.025 .156 .125 .083	.427 2.56 2.17 1.48 1.17		
1 1 1 1	.049 .042 .040 .032 .025	.539 .466 .444 .358 .282	1 5/8 1 5/8 1 3/4 1 3/4 1 3/4	.049 .045 .125 .095	.893 .823 2.35 1.82 1.27		
1 1 1 1/8 1 1/8 1 1/8	.020 .018 .125 .065	.227 .209 1.44 .797 .610	1 3/4 1 3/4 1 3/4 1 3/4 1 3/4	.057 .049 .045 .035	1.14 .964 .888 .694 .636		
1 1/8 1 1/8 1 1/8 1 1/4 1 1/4	.040 .032 .025 .125 .120	.502 .404 .318 1.62 1.58	1 7/8 1 7/8 1 7/8 2 2	.188 .125 .065 .125	3.68 2.53 1.36 2.71 2.09		
1 1/4 1 1/4 1 1/4 1 1/4 1 1/4	.072 .065 .062 .049	.981 .891 .859 .681	2 2 2 2 2	.083 .065 .049 .042	1.85 1.46 1.11 .951		
1 1/4 1 1/4 1 1/4 1 1/4 1 3/8	.042 .040 .032 .025 .125	.587 .560 .451 .354	2 2 2 1/8 2 1/8 2 1/4	.032 .025 .125 .065 .125	.729 .571 2.89 1.54 3.07		

Continued



SEAMLESS CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

ROUND-GENERAL PURPOSE TEMPER In 12 to 14-foot Mill Lengths

Continued

	Wall	Weight		Wall	Weight
	Thickness	Lbs. per		Thickness	Lbs. per
O. D.	in	Lin. Ft.	O. D.	in	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
		, ,,			
2 1/4	.065	1.64	3 3/4	.065	2.77
2 1/4	.045	1.15	4	.134	5.99
2 1/4	.040	1.02	4	.125	5.60
2 3/8	.065	1.74	4	.065	2.96
2 1/2	.125	3.44	4	.040	1.83
2 1/2	.109	3.02	4 1/4	.125	5.97
21/2	.065	1.83	4 3/8	.065	3.27
2 1/2	.049	1.39	4 1/2	.125	6.33
2 1/2	.045	1.28	4 1/2	.065	3.34
2 1/2	.032	.914	4 3/4	.125	6.69
2 5/8	.065	1.93	5	.125	7.05
2 3/4	.125	3.80	5	.109	6.19
2 3/4	.109	3.35	5	.065	3.71
2 3/4	.065	2.02	5 1/4	.125	7.41
3	.250	8.00	5 1/2	.125	7.77
3	.125	4.16	5 3/4	.125	8.14
3	.065	2.21	6	.125	8.49
3	.064	2.20	6	.065	4.46
3	.049	1.67	6 1/4	.125	8.85
3	.032	1.10	6 1/2	.125	9.22
3 1/8	.062	2.22	6 3/4	.125	9.58
3 1/4	.125	4.52	7 1/4	.125	10.30
31/4	.065	2.40	7 1/2	.125	10.70
31/2	.134	5.22	7 3/4	.125	11.00
3 1/2	.125	4.88	8	.125	11.40
3 1/2	.065	2.58	8 1/4	.125	11.75
31/2	.032	1.29	8 1/2	.125	12.10
3 3/4	.125	5.24	10 1/4	.125	14.65

SEAMLESS CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

ROUND-HARD DRAWN

Polishing Quality

Suitable for Bending and Chrome Plating In Standard 12-foot Mill Lengths

1.05 .114 1.24



SEAMLESS CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

ROUND-LIGHT DRAWN In 12-foot Mill Lengths

O.D.	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)
5/32 3/16 3/4 1 1 1/4	.032 .032 .049 .049	.046 .058 .399 .541	1 1/2 2 2 1/4 2 1/2 3 1/8	.049 .049 .049 .049 .125	.826 1.11 1.25 1.39 4.36
			FT TEMPER Mill Lengths		
1/8 3/8 7/16	.028 .0403 .0403	.031 .155 .184	1/2 1/2 5/8	.0403 .025 .0403	.213 .138 .271

SEAMLESS CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

ROUND-CHROME-PLATED-HARD DRAWN In 12-foot Exact Lengths

1 1/4	.032	.451	-	1 1/2	.032	.544
1 1/4	.002	. 101		/ -		
1 3/8	.032	.497		2	.032	.729

SEAMLESS BRASS CYLINDER TUBE

COPPER ALLOY NO. 260 AND 330*

ROUND-HARD DRAWN In 12-foot Exact Lengths

I.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	Weight Lbs. per 12' Length (Approx.)	I.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	Weight Lbs. per 12' Length (Approx.)
1/2	.125	.905	10.9	3	.125	4.54	54.5
5/8	.125	1.09	13.1	3 1/2	.125	5.28	63.4
3/4	.125	1.26	15.1	3 3/4	.125	5.60	67.2
1	.125	1.63	19.6	4	.125	5.97	71.6
1 1/4	.125	1.99	23.9	5	.125	7.07	84.8
1 1/2	.125	2.35	28.2	5 1/4	.125	7.80	93.6
1 3/4	.125	2.71	32.5	5 3/4	.125	8.53	102.4
2	.125	3.07	36.8	6	.148	10.6	127.2
2 1/4	.125	3.43	41.2	6 8	.125	8.89	106.7
2 1/2	.125	3.80	45.6	8	.148	13.9	166.8
2 3/4	.125	4.18	50.2	8	.125	11.8	141.6

^{*}Sizes 1/2" through 4" are Low-Leaded Brass, Copper Alloy No. 330. Sizes Over 4" are Cartridge Brass, 70%, Copper Alloy No. 260.



SEAMLESS CARTRIDGE BRASS, 70% TUBE

COPPER ALLOY NO. 260

SQUARE-HARD DRAWN
In 12 to 14-foot Mill Lengths

	Wall Thickness	Weight Lbs. per		Wall Thickness	Weight Lbs. per
O.D.	in	Lin. Ft.	O.D.	in	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
1/4 x 1/4	.032	.100	7/8 x 7/8	.0403	.498
3/8 x 3/8	.0403	.198	1 x 1	.0403	.567
$1/2 \times 1/2$.0403	.271	$1\ 1/4 \times 1\ 1/4$.0403	.710
5/8 x 5/8	.0403	.345	$1 1/2 \times 1 1/2$.0508	1.09
$3/4 \times 3/4$.0403	.424	2 x 2	.0508	1.47

RECTANGULAR—HARD DRAWN In 12 to 14-foot Mill Lengths

3/8 x 3/4 .0403 .312 **l**

ROUND REEDED—HARD DRAWN In 12 to 14-foot Mill Lengths

3/8	.0403	.158	1	.0201	.227
1/2	.0403	.217	1 1 1/4 1 1/2 2	.0403	.571
5/8	.0201	.142	1 1/2	.0403	.689
3/4	.0201	.169	2	.0453	1.03

SEAMLESS RED BRASS, 85% TUBE

COPPER ALLOY NO. 230

ROUND-HARD DRAWN In 20-foot Mill Lengths

3.555 .065 2.71 **4.**00 .125 5.77

ROUND-SOFT TEMPER In Standard Mill Lengths

9/16 .035 .221 **I**



HIGH-LEADED BRASS TUBE

COPPER ALLOY NO. 332

CHEMICAL COMPOSITION*

Copper, 65.5%

Zinc. 32%

Lead, 1.5%

High-Leaded Brass Tube, basically a Yellow Brass containing 1.5% Lead, has excellent machinability, and is used for screw machine parts, couplings, bushings, optical instruments, threaded collars, nozzles, worm gears and trap nuts.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)
Rating 80
Type of Chip S
Capacity for Being Cold Worked Fair
Capacity for Being Hot Formed Poor
Hot Forgeability Rating
(Forging Brass = 100)
Hot Working Temperature
Annealing Temperature
800°-1200°F. or 425°-650°C.

Suitability for Being Joined by:
Soft Soldering Excellent
Brazing
Oxyacetylene Welding Not Recommended
Carbon Arc Welding Not Recommended
Gas Shielded Arc Welding Not Recom.
Coated Metal Arc Welding Not Recom.
Resistance Welding:
Snot Not Recommended

Spot Not Recommended Seam Not Recommended Butt Fair

MECHANICAL PROPERTIES*

Tensile Strength, p.s.i. Yield Strength, p.s.i. Shear Strength, p.s.i. Elongation, % in 2-in. Rockwell Hardness 1.0 x .049 Hard (35%) 75,000 60,000 — 7 B80, 30T69

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1650
Density, lbs., per cu. in. @ 68 F.
Specific gravity
Coefficient of Thermal Expansion
Thermal Conductivity
Electrical Resistivity (Annealed)
Electrical Conductivity (Annealed)
Thermal Capacity (Specific Heat)
Modulus of Elasticity (Tension)
Modulus of Rigidity

Liquidus 1710

0.308
8.53

0.0000113 per °F. from 68°F. to 572°F.
67 Btu./sq. ft./ft./hr./°F. @ 68 F.
39.9 Ohms (circ. mil./ft.) @ 68 F.
26 % IACS @ 68 F.
0.09 Btu./lb./°F. @ 68 F.
15,000,000 psi
5.600.000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M.

B135, Alloy 4

A.M.S.

4558B

Federal Military

MIL-B-13492 (ORD), Comp. 3

^{*}All Values nominal. Not to be used as specification requirements.



SEAMLESS HIGH-LEADED BRASS TUBE

COPPER ALLOY NO. 332

ROUND—HARD DRAWN In 12-foot Mill Lengths

O.D.	Wall Thickness in	Weight Lbs. per Lin. Ft.	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)
Inches	Inches	(Approx.)	inches	inches	(Approx.)
1/2	.125	.543	1 3/8	.125	1.81
5/8	.125	.723	1 1/2	.125	1.99
.675	.090	.612	1 3/4	.125	2.35
3/4	.125	.904	2	.125	2.71
7/8	.125	1.09	2 1/4	.125	3.07
1	.125	1.27	2 1/2	.125	3.44
1 1/4	.125	1.63	2 3/4	.125	3.80

SEAMLESS COMMERCIAL BRONZE 90% TUBE

COPPER ALLOY NO. 220

ROUND—HALF HARD Suitable for Polishing & Plating In 10-foot Mill Lengths

1 .049 .559 I

COMMERCIAL BRONZE, 90% WAVEGUIDE TUBE

COPPER ALLOY NO. 220

In 12 to 14-foot Mill Lengths

		Design No.				Design No.	
1/2 x 1/4 .702 x .391 1 x 1/2 1 1/4 x 5/8	.040 .040 .050	790-T 1302-T 787-T 785-T	.199 .298 .534 .820	1 1/2 x 3/4 2 x 1 3 x 1 1/2 6.66 x 3.41	.064 .064 .080	784-T 783-T 782-T 781-T	1.00 1.408 2.648 6.121

COMMERCIAL BRONZE, 90% TUBE

COPPER ALLOY NO. 220

(For Stock Listings, See Page 61, this Section.)

CHEMICAL COMPOSITION*

Copper, 90%

Zinc. 10%

Commercial Bronze, 90% tube has excellent cold working properties. Stronger and harder than copper, with good resistance to stress corrosion and season cracking, it is used principally for builders' hardware, projectile rotating bands, and outdoor lighting fixtures.

FABRICATION PROPERTIES*

Suitability for Being Joined by;
Soft Soldering Excellent
Brazing Excellent
Oxyacetylene Welding Good
Carbon Arc Welding Fair
Gas Shielded Arc Welding Good
Coated Metal Arc Welding Not Recom.
Resistance Welding:
Spot Not Recommended
Seam Not Recommended
Butt

MECHANICAL PROPERTIES* (1.0 x 0.049)

	0.035 mm Anneal	Hard (35%)
Tensile Strength, p.s.i.	38,000	60,000
Yield Strength, p.s.i.	12,000	53,000
Shear Strength, p.s.i.	28,000	37,000
Elongation, % in 2-in.	50	6
Rockwell Hardness	F57	B69, 30T72

PHYSICAL PROPERTIES*

Liquidus 1910
0.318
8.80
0.0000102 per °F. from 68 F. to 572°F.
109 Btu./sq. ft./ft./hr./°F. @ 68 F.
23.6 Ohms (circ. mil./ft.) @ 68 F.
44 % IACS @ 68 F.
0.09 Btu./lb./°F. @ 68 F.
17,000,000 psi
6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.
A.S.T.M. B135, Alloy 7
A.M.S.
Federal

Military MIL-B-20292, Class B

^{*}All Values nominal. Not to be used as specification requirements.

CONDENSER AND HEAT EXCHANGER TUBES

Inhibited Admiralty (Antimonial, Type C; Phosphorized, Type D)

COPPER ALLOY NOS. 444 and 445

(For Stock Listings, See Following Page.)

CHEMICAL COMPOSITION*

Copper. 71.5%

Zinc. 27,5%

Tin. 1.00%

Antimony, 0.035% (Type C) Phosphorus, 0.04% (Type D)

Antimonial Admiralty, Copper Alloy No. 444, is practically immune to both dezincification and intercrystalline corrosion, as proved by the many millions of pounds used since 1935

Phosphorized Admiralty, Type D, (Copper Alloy No. 445) is similar in its performance to Antimonial Admiralty, and together with Antimonial Admiralty is a standby in the chemical and process industries.

These inhibited Admiralty tubes have good general corrosion resistance and for most applications give the best life per dollar of cost.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)
Rating 30
Type of Chip L
Capacity for Being Cold Worked . Excellent
Capacity for Being Hot Formed Fair
Hot Forgeability Rating
(Forging Brass - 100)

(Forging Brass = 100).....

Hot Working Temperature.....

 Suitability for Being Joined by:

Soft Soldering . Excellent
Brazing . Excellent
Oxyacetylene Welding . Good
Carbon Arc Welding . Fair
Gas Shielded Arc Welding . Fair
Coated Metal Arc Welding . Not Recom.

MECHANICAL PROPERTIES* (1.0 x 0.049)

0.025 Anneal

Tensile Strength, p.s.i. 53,000
Yield Strength, p.s.i. 22,000
Shear Strength, p.s.i. 35,000
Elongation, % in 2-in. 65
Rockwell Hardness F75, 30T37

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1650 Density, lbs., per cu. in. @ 68 F.

Specific gravity

Coefficient of Thermal Expansion Thermal Conductivity

Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension)

Modulus of Rigidity

Liquidus 1720

 $\frac{0.308}{8.53}$

0.0000112 per °F. from 68 F. to 572°F. 64 Btu,/sq. ft./hr./°F. @ 68 F. 41.5 Ohms (circ, mil./ft.) @ 68 F.

25 % IACS @ 68 F.

0.09 Btu./lb./°F. @ 68 F. 16.000,000 psi

6,000,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M. A.M.S.

B111, Type C, D

Federal

WW-T-756c, Amend, #1

Military MIL-T-2794

*All Values nominal. Not to be used as specification requirements.



ANTIMONIAL ADMIRALTY (TYPE C) CONDENSER & HEAT EXCHANGER TUBE

COPPER ALLOY NO. 444

(For Data, See Preceding Page)

Cut to Exact Sizes

O.D. Inches	Decimal Equivalent Inches	Weight* Lbs. per Lin. Ft. (Approx.)	O.D. Inches	Decimal Equivalent Inches	Weight* Lbs. per Lin. Ft. (Approx.)
5/8	.065	.444	1	.083	.928
5/8	.049	.344	1	.065	.741
3/4	.083	.675	1	.049	.568
3/4	065	.543			

PHOSPHORIZED ADMIRALTY (TYPE D) CONDENSER & HEAT EXCHANGER TUBE

COPPER ALLOY NO. 445

16 and 20-foot Exact Lengths

3/4 .083 .675 3/4 .065 .543

INHIBITED ALUMINUM BRASS CONDENSER & HEAT EXCHANGER TUBE

COPPER ALLOY NO. 687

In 20-foot Exact Lengths

7/8 .049 .482

CUPRO-NICKEL 30% CONDENSER & HEAT EXCHANGER TUBE

COPPER ALLOY NO. 715

In Exact Lengthsa

3/8 .049 .205 **I** 3/4 .065 .569

a3/8" O.D. in 12-foot lengths 3/4" O.D. in 12'11", 16' and 20' lengths.

For Data, See Preceding Page.

*Weights given are based on nominal wall thickness, and a lot weight tolerance of plus 5% as required by A.S.T.M. B-111. The invoice weight will be governed by current sales policy, which will be supplied upon request.

We cut Condenser and Heat Exchanger Tube to the exact lengths required by the customer, and therefore carry a great variety of lengths in stock in order to accomplish this with the least possible waste.



CUPRO-NICKEL, 30% TUBE

COPPER ALLOY NO. 715

(For Stock Listings, See Preceding Page.)

CHEMICAL COMPOSITION*

Copper, 69%

Nickel, 30%

Iron, 0.5%

Manganese, 0.5%

Cupro-Nickel, 30% tube has the best general corrosion resistance of any of the copper base alloys in condensers and heat exchangers. It has excellent resistance to impingement attack and to most acid and water conditions. It is being found increasingly useful for severely corrosive conditions when it is desired to obtain longer life than that given by other alloys. It is used by the Navy for all condenser and heat exchanger work on combat ships and submarines.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering
Capacity for Being Cold Worked Good	Oxyacetylene Welding
Capacity for Being Hot Formed Good	Carbon Arc Welding
Hot Forgeability Rating	Gas Shielded Arc Welding
(Forging Brass = 100)	Coated Metal Arc Welding
Hot Working Temperature	Resistance Welding:
1700°-1900°F. or 925°-1050°C.	Spot
Annealing Temperature	Seam
1200°-1500°F or 650°-825°C	Butt

..... Excellent Excellent Welding Good Velding Not Recom. Arc Welding Excellent Arc Welding Excellent

. Excellent Excellent Excellent

MECHANICAL PROPERTIES* (1.0 x 0.049)

Tensile Strength, p.s.i. Yield Strength, p.s.i. Shear Strength, p.s.i. Elongation, % in 2-in. Rockwell Hardness

54.000 20,000 45 F80, B45

0.035 mm Anneal

PHYSICAL PROPERTIES*

Melting Point, °F Solidus Density, lbs., per cu. in. @ 68 F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

Liquidus 2260

.323 0.0000090 per °F. from 68 F. to 572 F. 17 Btu./sq. ft./ft./hr./°F. @ 68 F. 225 Ohms (circ. mil./ft.) @ 68 F. 4.6 % IACS @ 68 F. 0.09 Btu./lb./°F. @ 68 F. 22,000,000 psi 8,300,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M.

B111

A.M.S. Federal

Military MIL-T-15005D (ships)

^{*}All Values nominal. Not to be used as specification requirements.



SPECIAL SHAPE SEAMLESS TUBE



Special Shape Seamless Tube can be furnished in Brass, Copper and Bronze, and in a variety of tempers to meet specific requirements.

Special shape tube has a definite place in the mechanical, electrical and industrial fields as well as the architectural field. It is very often used to replace a similar shape machined from solid material.

In addition to the more or less standard reeded, fluted and rope patterns, we can supply a large variety of special shapes, some of which are illustrated above. If you have a situation where special shape tube can be used, send us a drawing of what you have in mind, and we will let you know if we can supply it, and will quote you price and delivery.



RED BRASS, 85% PIPE

COPPER ALLOY NO. 230

(For Stock Listings, See Following Page.)

CHEMICAL COMPOSITION*

Copper, 85%

Zinc. 15%

Red Brass, 85% Pipe is more satisfactory than most other commercial alloys where water conditions are corrosive. It is very desirable in hot water lines, especially in circulating systems as the corrosiveness of any water is increased by the increase in temperature. It contains nominally 85% Copper, the balance Zinc, as specified in the U.S. Government Federal Specifications WW-P-351 for Grade A pipe for plumbing, and Bureau of Standards Simplified Practice Recommendation R217-49.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering
	Gas Shielded Arc Welding Good
Hot Forgeability Rating	
(Forging Brass = 100) —	Coated Metal Arc Welding Not Recom.
Hot Working Temperature	Resistance Welding:
1450°-1650°F. or 800°-900°C.	Spot Fair
Annealing Temperature	Seam Not Recommended
800°-1350°F. or 425°-725°C.	Butt

MECHANICAL PROPERTIES* (1.0 x 0.049)

7 Censile Strength, p.s.i. 244,000 44,000 18

PHYSICAL PROPERTIES*

1880 Liquidus Melting Point, °F. Solidus 1810 Density, lbs., per cu. in. @ 68 F. 0.316 8.75 Specific gravity 0.0000104 per °F. from 68 F. to 572 F. Coefficient of Thermal Expansion 92 Btu/sq. ft./ft./hr./°F @ 68 F. Thermal Conductivity Electrical Resistivity (Annealed) 28 Ohms (circ. mil./ft.) @ 68 F. 37 % IACS @ 68 F. Electrical Conductivity (Annealed) 0.09 Btu./lb./°F. @ 68 F. Thermal Capacity (Specific Heat) 17,000,000 psi Modulus of Elasticity (Tension) 6,400,000 psi Modulus of Rigidity

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. <u>B43</u> A.M.S. Federal

Military MIL-T-20168A

^{*}All Values nominal. Not to be used as specification requirements.



RED BRASS PIPE

COPPER ALLOY NO. 230

(For Data, See Preceding Page)

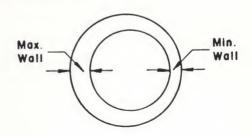
REGULAR In 12-foot Lengths

Standard Pipe Size Inches	O.D. Inches	Wall Thickness Inches	Weight Lbs. per Lin. Ft. (Approx.)	Standard Pipe Size Inches	O.D. Inches	Wall Thickness Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/8 1/4 3/8 1/2 3/4	.405 .540 .675 .840 1.050	.062 .082 .090 .107	.253 .447 .627 .934 1.27	2 1/2 3 3 1/2 4 5	2.875 3.500 4.000 4.500 5.562	.187 .219 .250 .250	5.99 8.56 11.2 12.7 15.8
1 1 1/4 1 1/2 2	1.315 1.660 1.900 2.375	.126 .146 .150 .156	1.78 2.63 3.13 4.12	6 8 10	6.625 8.625 10.750	.250 .312 .365	19.0 30.9 45.2
			In 20-foo	ot Lengths			
1/8 1/4 3/8 1/2 3/4	.405 .540 .675 .840 1.050	.062 .082 .090 .107 .114	.253 .447 .627 .934 1.27	1 1/2 2 2 1/2 3 4	1.900 2.375 2.875 3.500 4.500	.150 .156 .187 .219 .250	3.13 4.12 5.99 8.56 12.7
$\begin{array}{c} 1 \\ 1 \ 1/4 \end{array}$	1.315 1.660	.126 .146	1.78 2.63	5 6	5.562 6.625	.250 .250	15.8 19.0
1/8	.405	.100		STRONG ot Lengths	1.900	.203	4.10
1/4 3/8 1/2	.540 .675 .840	.123 .127 .149	.611 .829 1.23	2 2 1/2 3	2.375 2.875 3.500	.221 .280 .304	5.67 8.66 11.6
3/4 1 1 1/4	1.050 1.315 1.660	.157 .182 .194	1.67 2.46 3.39	3 1/2	4.000 4.500	.321 .341	14.1 16.9
			In 20-foo	t Lengths			
1/4 3/8 1/2 3/4	.540 .675 .840 1.050 1.315	.123 .127 .149 .157 .182	.611 .829 1.23 1.67 2.46	1 1/4 1 1/2 2 4	1.660 1.900 2.375 4.500	.194 .203 .221 .341	3.39 4.10 5.67 16.90
		R	EGULAR—CH In 12-foo	ROME-PLAT	ED		
1/8 3/8 1/2 3/4	.405 .675 .840 1.050	.062 .090 .107 .114	.253 .627 .934 1.27	$ \begin{array}{c cccc} & 1 & 1/4 & \\ & 1 & 1/2 & \\ & 2 & & \end{array} $	1.315 1.660 1.900 2.375	.126 .146 .150 .156	1.78 2.63 3.13 4.12



TERMS RELATING TO MEASUREMENTS OF ROUND TUBES

CONCENTRICITY, Concentricity implies coincidence of the centers of the OD and ID. However. since a relative displacement (eccentricity) of the centers is difficult to measure directly. while the resulting variation in Wall Thickness is relatively easy to measure. Concentricity and Eccentricity are preferably expressed in terms of the latter. Thus as a practical matter, Eccentricity is here defined and conventionally measured as the difference between the Maximum Wall and Minimum Wall determined at any one cross-section. Measurement of the individual Wall Thicknesses can best be made with a micrometer caliper.



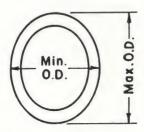
(Exaggerated for Illustration)

Eccentricity or Departure from
True Concentricity = Max. Wall - Min. Wall

Percent Eccentricity =
$$\frac{\text{Max. Wall - Min. Wall}}{\text{Average Wall}} \times 100$$

Studies of commercial tube show that the Eccentricity increases with increase of both Nominal Wall and Nominal OD.

ROUNDNESS. Roundness implies a truly circular periphery of the inside or the outside surface. Since experience shows the degree of departure from roundness is the same on the OD and the ID, but is more readily measured on the former, it is customary to determine



(Exaggerated for Illustration)

Departure from Roundness (i.e., Out-of-Roundness) = Max. OD - Min. O.D.

Percent Out-of-Roundness =
$$\frac{\text{Max. OD - Min. OD}}{\text{Average OD}} \times 100$$

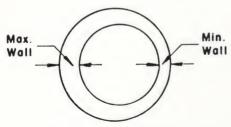
it is customary to determine departure from roundness of the OD, even when the tube is specified as to ID only. Out-of-roundness is determined as the total difference found at any one cross-section, between the individual maximum and minimum Outside Diameters which usually occur at or about 90° to each other. Roundness is not expressed as plus and minus.

Measurements can best be made by means of a micrometer caliper. Roundness is not to be confused with Concentricity as there is no connection whatever between the two. Roundness tolerances, given on BRASS & BRONZE Page 74, are applicable to drawn tube only.

WALL THICKNESS-AVERAGE. For all practical purposes, the Average Wall Thickness is the average at any one cross-section, of the maximum and minimum wall thickness, usually found at or very close to 180° apart. The individual measurements are most conveniently made by means of a micrometer caliper. If the tube were perfectly concentric, the maximum, minimum and average wall thicknesses would of course all be the same.

TERMS RELATING TO MEASUREMENTS OF ROUND TUBES

(Continued)



(Exaggerated for Illustration)

Average Wall = $\frac{\text{Max. Wall + Min. Wall}}{2}$

Departure of Actual Average Wall from that specified = Average Wall - Spec. Wall (If Average Wall is greater than Spec. Wall)

or, alternately = Spec. Wall
- Average Wall
(If Average Wall is less than
Spec. Wall)

Studies of commercial tubes show the variation of Average Wall Thickness from the nominal is dependent only on the diameter of the tube, and practically speaking, independent of the Wall Thickness itself; i.e., the Average Wall Thickness tolerance should be the same for a tube 1" x 0.100" as for a tube 1" x 0.020", whereas the Average Wall Thickness tolerance for any 2" diameter tube must be greater than for any 1" tube.

Inasmuch as tube users seldom specify a tolerance on Average Wall, no schedule is established.

TOLERANCES FOR SEAMLESS BRASS TUBES

ROUND SEAMLESS TUBES (Except Condenser Tubes)

GAUGE OR WALL THICKNESS TOLERANCES

Maximum deviation at any point—The following tolerances are plus and minus; if tolerances all plus or all minus are desired, double the values given.

TABLE I

NON-REFRACTORY ALLOYS

(Commercial Bronze 90%, Red Brass 85%, Cartridge Brass 70%, Low-Leaded Brass, High-Leaded Brass)

Wall Thickness	Outside Diameter in Inches						
	1/32	Over 1/8	Over 5/8	Over 1	Over 2	Over 4	Over 7
In Inches	to	to	to	to	to	to	to
	1/8 incl.	5/8 incl.	1 incl.	2 incl.	4 incl.	7 incl.	10 incl.
Incl380 and over				5%	5%	6%	6%
Incl284 to .380			.011	.012	.014	.016	.018
Incl220 to .284			.009	.010	.012	.014	.016
Incl165 to .220		.007	.0075	.008	.010	.012	.014
Incl120 to .165		.005	.006	.006	.008	.010	.012
Incl083 to .120		.004	.005	.005	.007	.009	.011
Incl058 to .083		.0035	.004	.004	.006	.008	.010
Incl035 to .058	.003	.003	.0035	.0035	.005	.007	
Incl025 to .035	.003	.0025	.0025	.003	.004		
Incl018 to .025	.003	.002	.002	.0025			
Under .018	.002	.001	.0015	.002			



TOLERANCES FOR SEAMLESS BRASS TUBE

ROUND SEAMLESS TUBES (Except Condenser Tubes)

GAUGE OR WALL THICKNESS TOLERANCES

Maximum deviation at any point—The following tolerances are plus and minus, if tolerances all plus or all minus are desired, double the values given.

Continued

TABLE II

REFRACTORY ALLOYS

(Inhibited Admiralty, Inhibited Aluminum Brass, Cupro-Nickel 30%, Cupro-Nickel 10%)

Wall Thickness	Outside Diameter in Inches						
In Inches	1/32 to 1/8 incl.	Over 1/8 to 5/8 incl.	Over 5/8 to 1 incl.	Over 1 to 2 incl.	Over 2 to 4 incl.	Over 4 to 7 incl.	Over 7 to 10 incl.
Incl380 and over Incl284 to .380 Incl220 to .284 Incl165 to .220 Incl120 to .165 Incl083 to .120 Incl058 to .083 Incl035 to .058 Incl025 to .035 Incl018 to .025 Under .018	.004 .004 .004 .0025	.007 .005 .0045 .004 .003 .0025	.012 .009 .007 .0065 .005 .0045 .003 .0025	6% .015 .013 .010 .0075 .0065 .0045 .004 .003	6% .018 .015 .013 .010 .009 .0075 .0065	8% .020 .018 .015 .013 .011 .010	8% .023 .020 .018 .015 .014 .013

TABLE III

MEAN DIAMETER* TOLERANCES

All Tolerances Plus and Minus

		Tolerance in Inches		
Specified Diameter in Inches	Tolerance Applies to	Non- Refractory Alloys	Refrac- tory Alloys	
Up to 1/8 incl. Up to 1/8 incl. Over 1/8 to 5/8 incl. Over 5/8 to 1 incl. Over 1 to 2 incl.	Inside Dia. Outside Dia. Inside or Outside Inside or Outside Inside or Outside	.002 .002 .002 .002 .0025	.003 .0025 .0025 .003	
Over 2 to 3 incl. Over 3 to 4 incl. Over 4 to 5 incl. Over 5 to 6 incl. Over 6 to 8 incl. Over 8 to 10 incl.	Inside or Outside	.004 .005 .006 .007 .008	.005 .006 .008 .009 .010	

^{*}The mean diameter of a tube is the average of the maximum and minimum outside diameters, or of the maximum and minimum inside diameters, as determined at any one cross-section of the tube.

Continued

TOLERANCES FOR SEAMLESS BRASS TUBE

MEAN DIAMETER TOLERANCES
Continued

Tolerances on a given tube may be specified with respect to any two, but not all three of the following:

- a. Outside dimension
- b Inside dimension
- c. Wall thickness

When tube is ordered to either O.D. or I.D., together with wall thickness, the tolerances given in Tables I and II, Pages 70, 71 BRASS & BRONZE Section apply. When tube is ordered by O.D. and I.D., the maximum plus and minus deviation of the wall thickness from the nominal at any point shall not exceed by more than 50% the values in Tables I and II.

Note: For Redrawn Tube, double the mean diameter tolerances given in Table III.

CONDENSER AND OTHER HEAT EXCHANGER TUBES Dimension and Weight Tolerances

DIAMETER (Applicable to Straight Lengths Only)

Diameter	Outside Diameter Tolerances in Inches (Plus and Minus)		
in Inches	Alloys other than Cupro-Nickel	Cupro-Nickel	
Up to 0.500 incl. Over 0.500 to 0.740 incl. Over 0.740 to 1.000 incl. Over 1.000 to 1.250 incl. Over 1.250 to 1.500 incl.	0.002 0.0025 0.003 0.0035 0.004	0.0025 0.003 0.0035 0.004 0.0045	

LENGTH (Applicable to Straight Lengths Only)

The length shall be not less than that specified, when measured at a temperature of 20° C. (68° F.), but may be more than that specified by the amounts in the following table:

Specific Length	Tolerances
in Feet	in Inches
Up to 15 incl. Over 15 to 20 incl. Over 20 to 30 incl. Over 30 to 60 incl. Over 60 to 100 incl.	3/32 1/8 5/32 1/4 3/8

SQUARENESS OF CUT OF TUBE-See Page 74, BRASS & BRONZE Section.

WALL THICKNESS

All tolerances plus, the upper limit being controlled by the weight tolerances.



TOLERANCES FOR SEAMLESS BRASS TUBE

CONDENSER AND OTHER HEAT EXCHANGER TUBES

WEIGHT

Any lot of 600 tubes or any shipment of more than 600 tubes may exceed the theoretical weight by not more than 5%. One cubic inch of the various alloys covered by these specifications shall be assumed to weigh:

Unit Weight Lb. per Cu. In.
0.308
0.323
0.323
0.323
0.301
0.316
0.308

ROUND SEAMLESS TUBES

Not Applicable to Condenser and Other Heat Exchanger Tubes (see preceding page).

TABLE I-LENGTH TOLERANCES-STRAIGHT LENGTHS-In Inches

Tolerances all plus; if all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

	Applicable Only to Full Length Pieces			
Length	For Outside Diameters up to 1" incl.	For Outside Diameters over 1'' to 4'' incl.	For Outside Diameters over 4''	
Specific lengths up to 6'' incl over 6'' to 2' incl over 2' to 6' incl over 6' to 14' incl over 14'	1/32 1/16 3/32 1/4 1/2	1/16 3/32 1/8 1/4 1/2	1/8 1/4 1/4 1/2 1	

TABLE II-SCHEDULE OF SPECIFIC LENGTHS WITH ENDS

Outside Diameter (In Inches)	Nominal Length (In Feet)	Minimum Length* of Shortest Piece (In % of Nominal Length)	Max. Permissible Weight of Ends (In % of Lot Weight)
Up to 1 incl Over 1 to 2 incl Over 2 to 3 incl Over 3 to 4 incl	6 to 20 incl.	70	20
	6 to 20 incl.	60	25
	6 to 20 incl.	55	30
	6 to 20 incl.	50	40

^{*}Expressed to the nearest 1/2 foot.

TABLE III-LENGTH TOLERANCES FOR COILS-SPECIFIC LENGTHS-All Plus-In Inches

Outside Diameter	For Nominal Lengths (In Feet)		
(In Inches)	Up to 50 incl.	Over 50 to 100	
Up to 2 incl	12	24	



TOLERANCES FOR SEAMLESS BRASS TUBE

ROUND SEAMLESS TUBES - Continued

Not Applicable to Condenser and Other Heat Exchanger Tubes (See Pages 72, 73, this section)

TABLE IV-LENGTH TOLERANCES FOR COILS-MILL LENGTHS (In percent of nominal length) All Plus

Outside Dispuston	Applicable Only to Full Length Pieces			
Outside Diameter (In Inches)	Up to 100' incl.	Over 100' to 2000' incl.		
Up to 1 incl. Over 1 to 2 incl.	5%* or 2', whichever value is greater 5%* or 2', whichever value is greater	10%* No tolerances established		

^{*}Expressed to the nearest foot.

TABLE V-COIL SCHEDULE OF MILL LENGTHS WITH ENDS

Outside Diameter (In Inches)	Nominal Length (In Feet)	Shortest Permissible Length	Max. Permissible Weight of Ends (In % of lot weight)
Up to 1 incl. Over 1 to 2 incl. Up to 1 incl.	Up to 100 incl. Up to 100 incl. Over 100 to 2000 incl.	70%* of nominal length 60%* of nominal length 50 feet	10% 20% 50%**

^{*}Expressed to the nearest foot.

Up to 10% of lot weight between 50 feet and one-quarter of full length; and up to 40% between one-quarter and full length.

SQUARENESS OF CUT

(Not applicable to Extruded Tube, Redraw Tube or any tube furnished in coils.)

The angle of cut of the end of the tube may depart from square by not more than .010'' for tubes up to and including 5/8'' O.D.; for tubes over 5/8'' O.D., by not more than .016'' per inch of diameter.

STRAIGHTNESS TOLERANCES

For tube in any drawn temper from 1/4" to 3 1/2" outside diameter, but not copper water tube, pipe, redraw tube, extruded tube or any annealed tube.

Length, Feet	Maximum Curvature (Depth of arc), Inches		
Over 3 to 6, incl.	3/16		
Over 6 to 8, incl.	5/16		
Over 8 to 10, incl.	1/2		

For lengths greater than 10 feet the maximum curvature shall not exceed 1/2" in any 10 foot portion of the total length.

ROUNDNESS* TOLERANCES

For tube and pipe in any drawn temper in straight lengths. Not applicable to as Extruded Tube, Redraw Tube, Annealed Tube or any tube furnished in coils, or Drawn Tube whose wall thickness is under .016'.

Compliance with the Roundness Tolerance shall be determined by taking measurements on the outside diameter only, irrespective of the manner in which the tube dimensions are specified; whether outside diameter and wall thickness, outside diameter and inside diameter, or inside diameter and wall thickness.

T/D, Ratio of	Roundness Tolerances
Nominal Wall	Expressed in Percent
Thickness to	of Nominal Outside
Nominal Outside	Diameter (Expressed
Diameter	to the nearest .001'')
.01 to .03 incl.	1.5%
Over .03 to .05 incl.	1.0%
Over .05 to .10 incl.	0.8% or .002", which-
	ever value is greater
Over .10	0.7% or .002'', which-
	ever value is greater

*The deviation from roundness is measured as the difference between major and minor outside diameters, as determined at any one cross-section of the tube.

^{**}Short pieces may be included as follows:



TOLERANCES FOR SEAMLESS BRASS TUBE

SEAMLESS TUBES

RECTANGULAR (Including SQUARE)-HEXAGONAL-OCTAGONAL

NON-REFRACTORY ALLOYS

Commercial Bronze 90%, Red Brass 85%, Cartridge Brass 70%, Low-Leaded Brass, High-Leaded Brass)

TABLE I-WALL THICKNESS TOLERANCES-In Inches

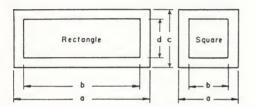
Tolerances are plus and minus; if tolerances all plus or minus are desired, double the values given. For rectangular tube, the major distance across flats determines the tolerance applicable to both major and minor distances.

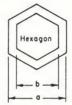
	For Outside or Inside Dimensions Across Flats, in Inches						
Wall Thickness	1/32	Over 1/8	Over 5/8	Over 1	Over 2	Over 4	Over 7
in Inches	to	to	to	to	to	to	to
	1/8 incl.	5/8 incl.	1 incl.	2 incl.	4 incl.	7 incl.	10 incl.
Under .018	.002	.002	.0025	.003			
.018 incl. to .025	.003	.0025	.003	.0035			
.025 incl. to .035	.0035	.0035	.0035	.004	.006		
.035 incl. to .058	.004	.004	.0045	.005	.007	.009	
.058 incl. to .083		.005	.006	.007	.008	.010	.012
.083 incl. to .120		.007	.008	.009	.010	.012	.014
.120 incl. to .165		.009	.010	.011	.012	.014	.016
.165 incl. to .220		.011	.012	.013	.015	.017	.019
.220 incl. to under .284 .			.015	.016	.018	.020	.022

TABLE II-TOLERANCES ON DIMENSIONS ACROSS FLATS-In Inches

Tolerances are plus and minus; if tolerances all plus or minus are desired, double the values given. For rectangular tube, the major distance across flats determines the tolerance applicable to both major and minor distances.

Dimension Toler-		Dimension	Toler-
a" or "b" (see sketches) ances		"a" or "b" (see sketches)	ances
(In Inches) (In Inches)		(In Inches)	(In Inches)
Up to 1/8 incl	.003 .004 .005 .006	Over 3 to 4 incl	.008 .009 .010 .011 .012







Nominal dimension "a" determines tolerance applicable to both "a" and "c" Nominal dimension "b" determines tolerance applicable to both "b" and "d"

TOLERANCES FOR SEAMLESS BRASS TUBE

RECTANGULAR (Including SQUARE) - HEXAGONAL - OCTAGONAL

NON-REFRACTORY ALLOYS-Continued

TABLE III

PERMISSIBLE RADII FOR COMMERCIALLY SHARP CORNERS In Inches

For Wall Thicknesses	Maximum Radii		
(In Inches)	Outside Corners	Inside Corners	
Up to .058 inclusive	3/64 1/16 3/32 Not established	1/32 1/32 1/32 Not established	

SQUARENESS OF CUT (Applicable to Straight Lengths only):

The departure from squareness of the end of any tube shall not exceed the following:

For tube up to and including 5/8" dimension

For tube over 5/8" dimension

LENGTH TOLERANCES: (see Pages 72, 73 this section.)

STRAIGHTNESS TOLERANCES: 1/2" maximum curvature (depth of arc) in any 6 foot portion of the total length.

Tolerances on a given tube may be specified with respect to any two, but not all three of the following: (a) Outside dimensions; (b) Inside dimensions; (c) Wall thickness.

TOLERANCES FOR BRASS PIPE

WEIGHT AND WALL THICKNESS TOLERANCES

Pipe Size	Weight per Foot Tolerances	Wall Thickness Tolerances		
in Inches	Plus and Minus	Minus	Plus	
Up to 6 incl Over 6 to 8 incl Over 8	5% 7% 8%	5%* 7%* 8%*	Limited only by weight tolerances	

^{*}Expressed to the nearest 0.001"

LENGTH TOLERANCES: Standard lengths 12 and 20 feet plus and minus 1/2".

SQUARENESS OF CUT TOLERANCES: Same as for Seamless Tube, see page 74, this section.

ROUNDNESS TOLERANCES: Same as for Seamless Tube, see page 74, this section.



RED BRASS PIPE

DIMENSIONS AND WEIGHTS-STANDARD PIPE SIZES

REGULAR

Pipe Nomina Size in Outside Inches Diameter	Nomina	l Dimensions in	Cross Sectional Area of	Pounds per Foot	
	Inside Diameter	Wall Thickness	Bore in Sq. In.		
1/8	.405	.281	.062	.062	.253
1/4	.540	.376	.082	.110	.447
3/8	.675	.495	.090	.192	.627
1/2	.840	.626	.107	.307	.934
3/4	1.050	.822	.114	.531	1.27
1	1,315	1.063	.126	.887	1.78
1 1/4	1.660	1.368	.146	1.47	2.63
1 1/2	1.900	1.600	.150	2.01	3.13
2	2.375	2.063	.156	3.34	4.12
2 1/2	2.875	2.501	.187	4.91	5.99
3	3,500	3.062	.219	7.37	8.56
3 1/2	4.000	3.500	.250	9.62	11.2
4	4.500	4.000	.250	12.6	12.7
5	5.562	5.062	.250	20.1	15.8
6	6.625	6.125	.250	29.5	19.0
8	8.625	8.001	.312	50.3	30.9
10	10.750	10.020	.365	78.8	45.2
12	12.750	12.000	.375	113.	55.3

EXTRA STRONG

Pipe Size	Nomina	al Dimensions in	Cross Sectional Area of Pour			
in Outsid	Outside Diameter	Inside Diameter	Wall Thickness	Bore in Sq. In.	per Foot	
1/8	.405	.205	.100	.033	.363	
1/4	.540	.294	.123	.068	.611	
3/8	.675	.421	.127	.139	.829	
1/2	.840	.542	.149	.231	1.23	
3/4	1.050	.736	.157	.425	1.67	
1	1.315	.951	.182	.710	2.46	
1 1/4	1.660	1.272	.194	1.27	3.39	
1 1/2	1.900	1.494	.203	1.75	4.10	
2	2.375	1.933	.221	2.94	5.67	
2 1/2	2.875	2.315	.280	4.21	8.66	
3	3.500	2.892	.304	6.57	11.6	
3 1/2	4.000	3.358	.321	8.86	14.1	
4	4.500	3.818	.341	11.5	16.9	
5	5.562	4.812	.375	18.2	23.2	
6	6.625	5.751	.437	26.0	32.2	
8	8.625	7.625	.500	45.7	48.4	
10	10.750	9.750	.500	74.7	61.1	



BURSTING PRESSURE OF TUBES

The chart on the following page is used for determining the approximate bursting pressure of a tube of a given alloy, dimension and temper. Inside and outside diameters are listed on the horizontal axis of this chart in order that one may use whichever suits the individual case. When calculations are based on outside diameter measurements, the results will be in accord with those most commonly used. However, theoretical bursting pressures will be somewhat lower than the actual bursting pressures. This has the advantage of compensating for certain variables which may adversely affect bursting strength such as eccentricity, temper and local irregularities.

For thin wall tube the discrepancy between calculated and actual bursting pressures using outside diameter measurements is not large. However, this discrepancy becomes large with this method on thick wall tube. Calculations based on inside diameters give results which are closer to actual bursting pressures. These pressures apply

only to the nominal tube itself and do not take into account limitations which may be imposed by wall thickness reductions such as from threading, machining or dimensional variations.

The bursting pressure of the tube is equal to the product of the constant K and the tensile strength of this alloy. K is obtained from the diagonal line on the chart on the following page.

Bursting Pressure = K x Tensile Strength of Alloy.

For calculation of bursting pressure both average and minimum Tensile Strength values are listed in the table below, in order that either average or minimum bursting pressures may be calculated as desired. When minimums are desired the minimum wall thickness should be used rather than the nominal. The values obtained by these calculations should only be considered as engineering approximations and not as guaranteed performance figures.

		Minimu	m Tens	ile Streng	th,p.s.i.	Average Tensile Strength, p.s.i.			
Alloy	Outside Diameter Inches	An- nealed	Light Drawn	Drawn General Purpose	Hard Drawn	An- nealed	Light Drawn	Drawn General Purpose	Hard Drawn
Copper	Up to 4 Over 4	30,000 30,000	36,000 36,000	40,000 38,000	45,000	34,000 34,000	42,000 40,000	55,000 45,000	55,000
Commercial Bronze, 90%	Up to 4 Over 4	34,000 34,000	40,000 38,000	44,000 42,000	52,000	38,000 38,000	47,000 45,000	60,000 50,000	60,000
Cupro-Nickel,	Up to 4 Over 4	40,000 40,000	53,000 50,000	57,000 55,000	62,000	47,000 47,000	60,000 58,000	70,000 62,000	70,000
Red Brass, 85%	Up to 4 Over 4	36,000 36,000	44,000 44,000	52,000 50,000	57,000	42,000 42,000	54,000 52,000	66,000 56,000	66,000
Inhibited Aluminum Brass	Up to 4	50,000		70,000	86,000	60,000		94,000	94,000
Inhibited Admiralty	Up to 4	48,000		60,000	72,000	54,000		80,000	80,000
Cartridge Brass, 70%	Up to 4 Over 4	45,000 45,000		56,000 54,000	70,000	50,000 50,000		78,000 68,000	78,000
Cupro-Nickel, 30%	Up to 4 Over 4	50,000 50,000	66,000 63,000	70,000 68,000	76,000	54,000 54,000	73,000 70,000	84,000 78,000	84,000
Low Leaded Brass	Up to 4 Over 4	46,000 46,000		60,000 58,000	72,000	52,000 52,000		80,000 72,000	80,000
High Leaded Brass	Up to 4	45,000		60,000	72,000	52,000		80,000	80,000
Naval Brass	Up to 4 Over 4	54,000 54,000	72,000 70,000	75,000 73,000	86,000	60,000 60,000	77,000 75,000	93,000 86,000	93,000

MAXIMUM WORKING PRESSURE

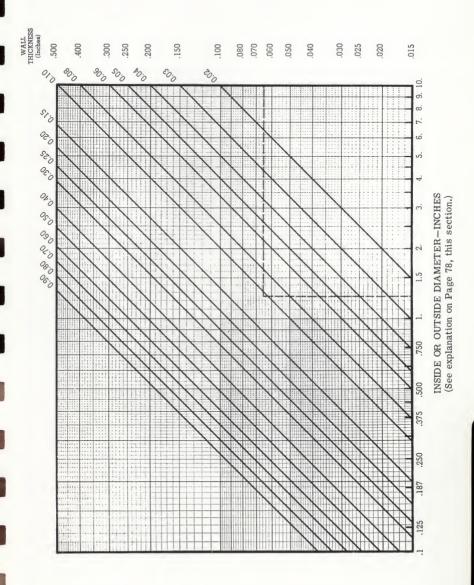
(Allowable Internal Pressure)

The calculation of maximum working pressure of tubes is covered in detail on Pages

80 and 81, this section. This section on bursting pressure should not be used to calculate working pressure.



BURSTING PRESSURE OF TUBES



To use the chart, follow the vertical line representing the outside or inside diameter to a point where it intersects a horizontal line indicating the wall thickness of the tube in question. The point of intersection will give a value for a constant K read from the diagonal lines or estimated from the distance between two such. Example: For an outside diameter of $1\ 1/4$ '' and wall thickness of 0.065, the constant K = 0.11 (approximately).

BURSTING PRESSURE OF TUBES

Continued

EXPANDING PRESSURE

For operations such as hydraulic expansion of tube it may be desired to calculate the pressure to produce permanent deformation or expansion. This pressure can be approximated by substituting the proper yield strength value for tensile strength in the above formula.

Since yield strengths are considerably influenced by minor variations in processing, no attempt has been made to present the data as has been done with the tensile strengths. The necessary data should be obtained for each specific case, either from the producing mill or by actual tensile

MAXIMUM WORKING PRESSURE OF TUBES

(ALLOWABLE INTERNAL PRESSURE)

The chart on the following page is used for determining the maximum working pressure of a tube of a given alloy, dimension and temper. It is based on the formula $P = \frac{2S \left(tm - C\right)}{D - .8 \left(tm - C\right)} \ \ \text{for the calculation of}$

 $P = \frac{1}{D - .8 \text{ (tm - C)}}$ for the calculation of working pressures taken from the American Standards Association publication B31.1 (1955) Section 1, Power Piping Systems where

tm = Maximum wall thickness in inches.

P = Maximum working pressure (Allowable Internal Pressure).

D = Outside Diameter in inches.

S = Allowable stress at the operating temperature in pounds per square inch.

C = Allowance for threading, mechanical strength and/or corrosion in inches.

The wall thickness (tm) should be the mini-

mum minus the necessary value of C, the allowance for threading, mechanical stress and/or corrosion. Of course, for the base tube alone C is equal to 0.

The maximum working pressure of the tube is equal to the product of the constant K read from the diagonal on the chart on Page 81 and the allowable stress at the operating temperature for the alloy in question. Working Pressure = K x Allowable stress of alloy. For calculation of the working pressure, allowable stress values are listed below. These are condensed from Table UNF 23, A.S.M.E. Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels (1956), and supplemented by similarly derived data for alloys not included in Table UNF 23. The values taken from this source to be used in the above equation are as follows:

	Maxim	um Allo	wable Str	ess Valu	es of Tu	bes in I	bs. per	Sq. In.
Material and Condition	Up to	Up to	Up to	Up to	Up to	Up to	Up to	Up to
	100°F	200°F	300°F	350°F	400°F	500°F	600°F	700°F
Copper:								
Annealed	6,000	5,900	5,000	3,800	2,500			
Light Drawn	9,000	8,700	8,000	5,000	2,500			
Hard Drawn	11,300	11,000	8,000	5,000	2,500			
Red Brass:								
Annealed	8,000	8,000	8,000	6,000	3,000			
Inhibited Admiralty:								
Annealed	10,000	10,000	10,000	8,000	5,000			
Inhibited Aluminum Brass:								
Annealed	12,000	12,000	12,000	7,500	3,000			
Naval Brass:								
Annealed	12,500	12,000	10,500	7,500	2,000			
Cupro-Nickel, 30%:								
Annealed	12,000	11,300	10,800	10,600	10,300	9,900	9,600	9,400
Cupro-Nickel, 20%:								
Annealed	10,700	10,500	10,300	10,100	9,900	9,300	8,400	7,000
Cupro-Nickel, 10%:								
Annealed	10,000	9,800	9,300	9,000	8,700	7,500	6,000	
Cartridge Brass, 70%:								
Annealed	10,000	10,000	10,000	6,000	3,000			
Low Leaded Brass:								
Annealed	10,000	10,000	10,000	6,000	3,000			

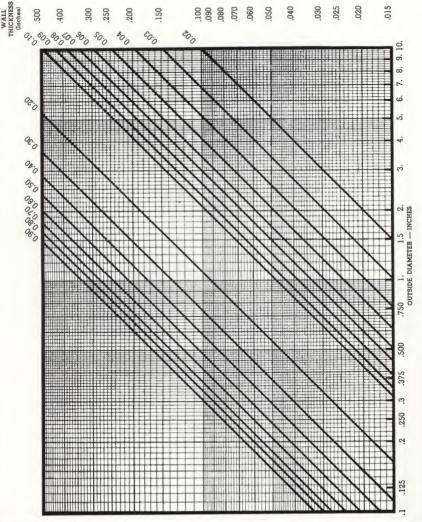


MAXIMUM WORKING PRESSURE OF TUBES

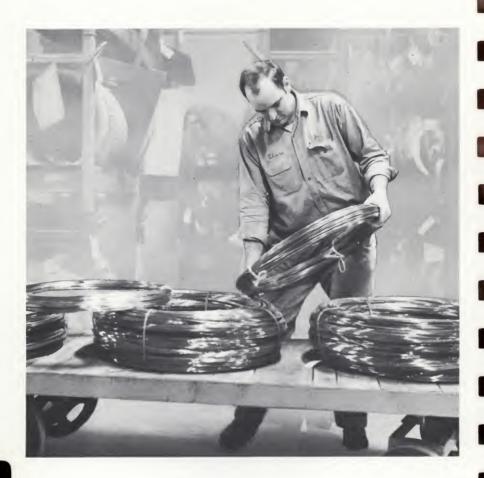
(ALLOWABLE INTERNAL PRESSURE)

Continued

It is undesirable to calculate the working pressure from the bursting pressure modified by a safety factor because the creep rate, stress rupture or temperature effects on mechanical properties may be the governing consideration rather than the room temperature tensile strength used in calculating the bursting pressure.



To use the chart, follow the vertical line representing the Outside Diameter to a point where it intersects a horizontal line indicating the wall thickness of the tube in question. The point of intersection will give a value for constant K read from the diagonal lines or estimated from the distance between two such. Example: For an Outside diameter of $1\ 1/2$ " a minimum wall thickness of 0.050" including the allowance for C, the constant K equals 0.07 (approximately).



BRASS & BRONZE WIRE IN COILS

Chase Metals Service Centers stock brass and bronze wire in a very wide range of alloys, tempers and sizes. We can give you prompt delivery of alloy wire for any standard and for many special applications.

Chase copper alloy wire is produced in the mill by the hot extrusion process and then progressively drawn to final gauge which insures the highest possible quality.

Close supervision in the mill and in the laboratory, continuous inspection and care of dies and rolls, modern annealing equipment, rugged tests to determine physical or surface defects are all part of the care and know-how employed in the production of Chase wire.

Some of the advantages Chase wire offers are: 1) Freedom from physical defects, 2) Uniformity of surface texture and color, 3) Accuracy of gauge, 4) Precise adjustment of temper. 5) Uniformity of mixture, 6) Control of grain size.

We shall be glad to advise you on the proper alloy and temper best suited for your work.



YELLOW BRASS, 65% WIRE

COPPER ALLOY NO. 270

(For Stock Listings, See Following Page)

CHEMICAL COMPOSITION*

Copper, 66%

Zinc. 34%

Yellow Brass, 65%, characterized by its bright yellow color, possesses excellent tensile strength and good ductility. It will withstand severe cold working and is especially suited for forming. Important uses are for hooks and eyes, pins, rivets, screws, nuts, bolts and springs.

FABRICATION PROPERTIES*

MECHANICAL PROPERTIES*

	0.035 mm	0.100'' dia.	Quarter Hard	Half Hard
	Anneal	Eighth Hard (11%)	(21%)	(37%)
Tensile Strength, p.s.i. Yield Strength, p.s.i. Shear Strength, p.s.i. Elongation, % in 2-in. Rockwell Hardness	50,000 18,000 34,000 60	60,000 45,000 38,000 30	70,000 54,000 42,000 20	88,000 63,000 47,000 15

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1660	Liquidus 1710
Density, lbs., per cu. in. @ 68 F.	0.306
Specific gravity	8.47
Coefficient of Thermal Expansion	0.0000113 per °F. from 68 F. to 57
Thermal Conductivity	67 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	38.4 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	27 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.09 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	15,000,000 psi
Modulus of Rigidity	5,600,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	80B
A.S.T.M.	B134, Alloy 7
A.M.S.	4713A, 4712A
Federal	QQ-W-321c, Comp.
Military	

*All Values nominal. Not to be used as specification requirements.

F. to 572 F.



YELLOW BRASS WIRE

COPPER ALLOY NO. 270

SOFT TEMPER
In Mill Coils

Diameter		Weight Diame			Weight
Inches	Decimal	Lbs. per	Inches	Decimal	Lbs. per
and	Equivalent	1000 Ft.	and	Equivalent	1000 Ft.
Gauge	Inches	(Approx.)	Gauge	Inches	(Approx.
No. 2 B. & S.	.2576	192.	No. 15 B. & S.	.0571	9.40
No. 4 B. & S.	.2043	120.	No. 16 B. & S.	.0508	7.44
No. 5 B. & S.	.1819	95.5	No. 17 B. & S.	.0453	5.92
No. 6 B. & S.	.1620	75.7	No. 18 B. & S.	.0403	4.68
No. 7 B. & S.	.1443	59.8	No. 19 B. & S.	.0359	3.72
No. 8 B. & S.	.1285	47.4	No. 20 B. & S.	.0320	2.95
No. 9 B. & S.	.1144	37.6	No. 21 B. & S.	.0285	2.34
No. 10 B. & S.	.1019	30.0	No. 22 B. & S.	.0253	1.85
No. 11 B. & S.	.0907	23.7	No. 23 B. & S.	.0226	1.47
No. 12 B. & S.	.0808	18.8	No. 24 B. & S.	.0201	1.17
No. 13 B. & S.	.0720	15.0	No. 25 B. & S.	.0179	.924
No. 14 B. & S.	.0641	11.8	No. 26 B. & S.	.0159	.729
		натъ	HARD		
		In Mil	I Cons		
No. 5 B. & S.	.1819	In Mil. 95.5	No. 14 B. & S.	.0641	11.8
	.1819 .1620			.0641 .0571	11.8 9.40
No. 6 B. & S.		95.5	No. 14 B. & S.		9.40 7.44
No. 6 B. & S. No. 7 B. & S.	.1620	95.5 75.7	No. 14 B. & S. No. 15 B. & S.	.0571	9.40 7.44 5.92
No. 6 B. & S. No. 7 B. & S. No. 8 B. & S.	.1620 .1443	95.5 75.7 59.8	No. 14 B. & S. No. 15 B. & S. No. 16 B. & S.	.0571 .0508	9.40 7.44
No. 6 B. & S. No. 7 B. & S. No. 8 B. & S. No. 9 B. & S.	.1620 .1443 .1285	95.5 75.7 59.8 47.3 37.5	No. 14 B. & S. No. 15 B. & S. No. 16 B. & S. No. 17 B. & S. No. 18 B. & S. No. 19 B. & S.	.0571 .0508 .0453 .0403	9.40 7.44 5.92 4.68 3.72
No. 5 B. & S. No. 6 B. & S. No. 7 B. & S. No. 8 B. & S. No. 9 B. & S. No. 10 B. & S. No. 11 B. & S.	.1620 .1443 .1285 .1144	95.5 75.7 59.8 47.3 37.5	No. 14 B. & S. No. 15 B. & S. No. 16 B. & S. No. 17 B. & S. No. 18 B. & S. No. 19 B. & S. No. 20 B. & S.	.0571 .0508 .0453 .0403 .0359	9.40 7.44 5.92 4.68 3.72 2.95
No. 6 B. & S. No. 7 B. & S. No. 8 B. & S. No. 9 B. & S. No. 10 B. & S.	.1620 .1443 .1285 .1144 .1019	95.5 75.7 59.8 47.3 37.5	No. 14 B. & S. No. 15 B. & S. No. 16 B. & S. No. 17 B. & S. No. 18 B. & S. No. 19 B. & S.	.0571 .0508 .0453 .0403	9.40 7.44 5.92 4.68 3.72

SCREW TEMPER In Mill Coils

Diameter		Diameter	
Inches		Inches	
.325	305.	.165	79.0
.281283	236.	.163164	75.9
.276277	222.	.158	72.8
.271	218.	.143144	59.7
.221223	158.	.139140	56.4
.212213	131.	.139	56.0
.209210	127.	.130131	49.4
.184	98.2	.117118	40.0
.182183	96.5	.114	37.4
.177178	91.6	.104105	34.0
.169170	83.3	.090091	23.7
.165166	79.4	.091	23.5



YELLOW BRASS WIRE

COPPER ALLOY NO. 270

(For Data, See Page 83, this Section.)

SPECIAL TEMPERS In Mill Coils

Diameter Inches	Temper	Weight Lbs. per 1000 Ft. (Approx.)	Diameter Inches	Temper	Weight Lbs. per 1000 Ft. (Approx.)
.211212	10% Hard	129.	.105	10% Hard	32.0
.164165	10% Hard	80.0	.092	20% Hard	23.8
.163	1/8 Hard	73.8	.083	10% Hard	20.0
.158159	10% Hard	73.3	.080	10% Hard	18.0
.139140	10% Hard	56.8	.070	10% Hard	14.8
.140	1/8 Hard	56.8	.057	1 No. Hard	9.46
.116	10% Hard	39.0	.049	10% Hard	6.96
.113114	10% Hard	37.7			

CARTRIDGE BRASS, 70% WIRE

COPPER ALLOY NO. 260

SPRING TEMPER
In Mill Coils

Diame	Diameter		Diame	eter	Weight	
Inches and	Decimal Equivalent	Weight Lbs. per 1000 Ft.	Inches and Gauge	Decimal Equivalent Inches	Lbs. per 1000 Ft. (Approx.)	
Gauge	Inches	(Approx.)	Gauge			
No. 2 B. & S.	.2576	192.	No. 15 B. & S.	.0571	9.40	
No. 4 B. & S.	.2043	120.	No. 16 B. & S.	.0508	7.44	
No. 5 B. & S.	.1819	95.5	No. 17 B. & S.	.0453	5.92	
No. 6 B. & S.	.1620	75.7	No. 18 B. & S.	.0403	4.68	
No. 7 B. & S.	.1443	59.8	No. 19 B. & S.	.0359	3.72	
No. 8 B. & S.	.1285	47.3	No. 20 B. & S.	.0320	2.95	
No. 9 B. & S.	.1144	37.5	No. 21 B. & S.	.0285	2.34	
No. 10 B. & S.	.1019	30.0	No. 22 B. & S.	.0253	1.85	
No. 11 B. & S.	.0907	23.7	No. 23 B. & S.	.0226	1.47	
No. 12 B. & S.	.0808	18.8	No. 24 B. & S.	.0201	1.17	
No. 13 B. & S.	.0720	15.0	No. 26 B. & S.	.0159	.729	
No. 14 B. & S.	.0641	11.8	No. 30 B. & S.	.0100	.288	

LOW BRASS 80% WIRE

COPPER ALLOY NO. 240

SOFT TEMPER On 5-lb. Spools

No. 30 Stubs' .012 .0468 | ...



CARTRIDGE BRASS, 70% WIRE

COPPER ALLOY NO. 260

(For Stock Listings, See Preceding Page.)

CHEMICAL COMPOSITION*

Copper, 70%

Zinc, 30%

Cartridge Brass, 70% wire has excellent tensile strength and is very ductile. It can be subjected to severe cold working. Common applications are chain, fasteners, grill work, pins, rivets, screws and springs.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing Excellent Oxyacetylene Welding Good Carbon Arc Welding Fair Gas Shielded Arc Welding Fair Coated Metal Arc Welding Not Recom. Resistance Welding: Spot Good Seam Not Recommended Butt Good
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MECHANICAL PROPERTIES* (0.080 in.)

Tensile Strength, p.s.i. Yield Strength, p.s.i. Shear Strength, p.s.i. Elongation, % in 2-in. Rockwell Hardness

Spring Temper 130,000 — 60,000 3

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus $\frac{1680}{F.}$ Density, lbs., per cu. in. @ $68 \frac{1}{F.}$ Specific gravity Coefficient of Thermal Expansion Thermal Conductivity (Annealed) Electrical Resistivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

Liquidus 1750 0.308 8.53 0.0000111 per °F. from 68 F. to 572 F. 70 Btu./sq. ft./ft./hr./°F. @ 68 F. 37.0 Ohms (circ. mil./ft.) @ 68 F. 28 % IACS @ 68 F. 0.09 Btu./lb./°F. @ 68 F. 16,000,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

6,000,000 psi

S.A.E. A.S.T.M. B134, #6 A.M.S. Federal Military

^{*}All Values nominal. Not to be used as specification requirements.



JEWELRY BRONZE 87.5% WIRE

COPPER ALLOY NO. 226

(For Stock Listings, See Following Page.)

CHEMICAL COMPOSITION*

Copper. 87.5%

Zinc. 12.5%

Jewelry Bronze, 87.5% is popular because of its gold color and high ductility. It is widely used for slide fasteners, costume jewelry and chain.

FARRICATION PROPERTIES*

MECHANICAL PROPERTIES* (0.100)

	0.020 mm Anneal
Tensile Strength, p.s.i.	44,000
Yield Strength, p.s.i.	18,000
Shear Strength, p.s.i.	31,000
Elongation, % in 2-in.	40
Rockwell Hardness	

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1840	Liquidus 1895
Density, lbs., per cu. in. @ 68 F.	0.317
Specific gravity	8.78
Coefficient of Thermal Expansion	0.0000103 per °F. from 68 F. to 572 F.
Thermal Conductivity	100 Btu./sq. ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	25.9 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	40 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.09 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	17,000,000 psi
Modulus of Rigidity	6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. A.M.S. Federal Military

^{*}All Values nominal. Not to be used as specification requirements.

JEWELRY BRONZE WIRE

COPPER ALLOY NO. 226

(For Data, See Preceding Page.)

ROUND-SOFT TEMPER In Mill Coils

Diam	eter	Weight	Dian	neter	Weight
Inches and Gauge	Decimal Equivalent Inches	Lbs. per 1000 Ft. (Approx.)	Inches and Gauge	Decimal Equivalent Inches	Lbs. per 1000 Ft. (Approx.)
	.144	62.2		.050	7.47
	.128	49.3		.044	5.80
	.114	39.1		.040	4.78
	.102	31.1		.038	4.29
	.090	24.2		.036	3.88
	.080	19.1		.033	3.25
	.070	14.6		.029	2.51
	.064	12.2	l	.025	1.84
	.060	10.8	I	.022	1.53
	.052	8.06			

SQUARE-SOFT TEMPER In Mill Coils

.100	.100	38.0	.064	.064	15.6
.090	.090	30.8	.057	.057	12.4
.080	.080	24.3	.050	.050	9.51

OLYMPIC BRONZE WIRE

COPPER ALLOY NO. 651

BOLT TEMPER-TYPE "B"-FOR COLD HEADING In Mill Coils

 .732738	1612.	 .364368	397.0
 .670676	1311.5	 .323327	314.9
 .607613	1080.0	 .266270	213.0
 .550554	890.3	 .208212	140.0
 .438442	570.8		

ANNEALED-TYPE "B"-FOR SEVERE COLD HEADING In Mill Coils

 .612	1080.0	1	.398	474.0
 .485		1	.328	314.9

OLYMPIC BRONZE (Low-Silicon Bronze, B) WIRE

COPPER ALLOY NO. 651

CHEMICAL COMPOSITION*

Copper, 97.5%

Silicon, 1.5%

Zinc. 1%

Olympic Bronze (B), a low-silicon, non-magnetic bronze, is highly resistant to stress corrosion and to fatigue. It offers good resistance to many corrosive agents such as various acids and is widely specified for equipment that processes beet and cane sugar syrups. Millions of silicon bronze bolts and other items of pole-line hardware are in service in transmission lines and power stations. It is the standard fastening material for motor boats and yachts, and finds wide use in chemical and other process plants where it comes in contact with corrosive solutions, such as inpulp and paper mills. Large amounts of Olympic Bronze are used in equipment for sewage treatment plants, reservoirs and water works plants. Olympic Bronze bolts and nuts are widely used in water meters and similar equipment.

FABRICATION PROPERTIES*

MECHANICAL PROPERTIES*

	0.100 Half Hard (37%)	0.250 Bolt Temper (60%)
Tensile Strength, p.s.i.	70,000	85,000
Yield Strength, p.s.i.	55,000	65,000
Shear Strength, p.s.i.	45,000	50,000
Elongation, % in 2-in.	15	12
Rockwell Hardness		B90

PHYSICAL PROPERTIES*

Liquidus 1940
0.316
8.75
0.0000099 per °F. from 68 F. to 572 F.
33 Btu./sq. ft./ft./hr/°F. @ 68 F.
86.4 Ohms (circ. mil./ft.) @ 68 F.
12 % IACS @ 68 F.
0.09 Btu./lb./°F. @ 68 F.
17,000,000 psi
6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. B99, Alloy B A.M.S.

Federal QQ-C-591d, Alloy No. 651
Military MIL-C-17516 (Navy) Comp. 2

^{*}All Values nominal. Not to be used as specification requirements.



PHOSPHOR BRONZE, 5% (A) WIRE

COPPER ALLOY NO. 510

CHEMICAL COMPOSITION*

Copper, 95%

Tin. 4.75%

Phosphorus, 0.25%

Its high resiliency and resistance to permanent set make Phosphor Bronze 5% (A) the generally accepted alloy for corrosion-resistant springs. It is also used for helical and leaf springs, bearings, lock washers, spring contacts, winding wire and wire brushes.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering . Excellent Brazing . Excellent Oxyacetylene Welding . Good Gas Shielded Arc Welding . Good Coated Metal Arc Welding . Fair Resistance Welding: Spot Good
900°-1250°F. or 475°-675°C.	Seam Fair Butt Excellent

MECHANICAL PROPERTIES*

Tensile Strength, p.s.i. Yield Strength, p.s.i. Shear Strength, p.s.i. Elongation, % in 2-in. Rockwell Hardness 0.100 Spring (84%) 140,000 78,000

3

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1050
Density, lbs., per cu. in. @ 68 F.
Specific gravity
Coefficient of Thermal Expansion
Thermal Conductivity
Electrical Resistivity (Annealed)
Electrical Conductivity (Annealed)
Thermal Capacity (Specific Heat)
Modulus of Elasticity (Tension)
Modulus of Rigidity

0.320 8.86 0.0000099 per °F. from 68 F. to 572 F. 40 Btu./sq. ft./ft./hr./°F. @ 68 F. 69.1 Ohms (circ. mil./ft.) @ 68 F. 15 % IACS @ 68 F.

1920

0.09 Btu./lb./°F. @ 68 F. 16,000,000 psi 6,000,000 psi

Liquidus

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. 81

B159, Alloy A

A.M.S.

4720B

Federal

QQ-W-401, Amend. 5

Military MIL-W-16602 (Bu ORD)

^{*}All Values nominal. Not to be used as specification requirements.



PHOSPHOR BRONZE 5% (A) WIRE

COPPER ALLOY NO. 510

SPRING TEMPER In Mill Coils

Diame	Diameter		Weight Diameter		Weight
Gauge	Decimal Equivalent Inches	Lbs. per 1000 Ft. (Approx.)	Gauge	Decimal Equivalent Inches	Lbs. per 1000 Ft. (Approx.)
No. 5 B. & S.	.1819	99.9	No. 18 B. & S.	.0403	4.90
No. 6 B. & S.	.1620	79.2	No. 19 B. & S.	.0359	3.89
No. 7 B. & S.	.1443	62.5	No. 20 B. & S.	.0320	3.09
No. 8 B. & S.	.1285	49.4	No. 21 B. & S.	.0285	2.45
No. 9 B. & S.	.1144	39.2	No. 22 B. & S.	.0253	1.93
No. 10 B. & S.	.1019	31.4	No. 24 B. & S.	.0201	1.22
No. 11 B. & S.	.0907	24.8	No. 25 B. & S.	.0179	.960
No. 14 Stubs'	.083	20.9	No. 26 B. & S.	.0159	.762
No. 12 B. & S.	.0808	19.7	No. 27 B. & S.	.0142	.608
No. 13 B. & S.	.0720	15.6	No. 28 B. & S.	.0126	.479
No. 14 B. & S.	.0641	12.4	No. 30 B. & S.	.0100	.302
No. 15 B. & S.	.0571	9.83	No. 31 B. & S.	.0089	.239
No. 16 B. & S.	.0508	7.78	No. 32 B. & S.	.0080	.193
No. 17 B. & S.	.0453	6.19			

Los Angeles stock 8 Nos. Hard-Stress Relieved.

NICKEL SILVER 15% WIRE

COPPER ALLOY NO. 754

SOFT TEMPER In Mill Coils

No. 9 B. & S. .1144 38.6 ...

NICKEL SILVER 10% WIRE

COPPER ALLOY NO. 745

SOFT TEMPER In Mill Coils

No. 4 B. & S. . .2043 123. No. 12 B. & S. .0808 19.3



TOLERANCES

In Inches

BRASS, BRONZE, NICKEL SILVER

WIRE

BARE WIRE, DRAWN TO FINAL SIZE

Diameter or Distance	Non-Refra	actory Alloys ^a	Refractory Alloys ^b	
between Parallel Surfaces in Inches	Round	Hexagonal Octagonal	Round	Hexagonal Octagonal
Up to .010 inclusive	.0001 .0002 .0003 .0004 .0005 .0006 .0008 .0010 .0015		.0002 .0003 .0005 .0007 .0008 .0010 .0015 .002 .002	 .002 .003 .003 .004 .004

anon-refractory Alloys: Yellow Brass; Low Brass, 80%; Jewelry Bronze; Olympic Bronze, B.

bREFRACTORY ALLOYS: Nickel Silver, 15%; Nickel Silver, 10%; Phosphor Bronze, 5% (A).





BRASS AND BRONZE SHAPES

Drawn or Extruded



In addition to the extruded bronze angles listed below, and the extruded brass angles, drawn brass angles and channels, and brass door saddles carried in stock as listed on the following page, Chase Metals Service can also supply hundreds of designs in extruded brass or bronze shapes for any architectural, industrial or mechanical application from our mill supply source.

We invite your inquiries and will be glad to quote prices and delivery on such items as hand rails, spindles, jambs, cornices and other structural numbers, or on special extruded shapes for industrial or mechanical uses.

EXTRUDED ARCHITECTURAL BRONZE ANGLES

COPPER ALLOY NO. 385

In 12 to 15 foot Mill Lengths

		-					
Dimen- sions Inches	Inches	Decimal Equivalent Inches	Weight Lbs. per Foot (Approx.)	Dimen- sions Inches	Thi	Decimal Equivalent Inches	Weight Lbs. per Foot (Approx.
1/2 x 1/2 1/2 x 1/2 1/2 x 3/4 1/2 x 1 5/8 x 5/8	1/8 1/8 1/8 1/8	.125 .101 .125 .125 .125	.40 .36 .60 .80	1 1/2 x 1 1/2 1 1/2 x 1 1/2 1 1/2 x 1 1/2 2 x 2 2 x 2	1/4 3/16 1/8 1/4 3/16	.250 .188 .125 .250 .188	2.53 1.94 1.32 3.40 2.60
3/4 x 3/4 1 x 1 .1 x 1 1 1/4 x 1 1/4	1/8 3/16 1/8 1/8	.125 .188 .125 .125	.63 1.25 .87 1.09	2 x 2 2 1/2 x 2 1/2 3 x 3	1/8 1/4 1/4	.125 .250 .250	1.78 4.37 5.30

BRASS & BRONZE 93.

BRASS ANGLES

DRAWN-HALF HARD
In 12 to 14 foot Mill Lengths

Dimen- sions Inches	Thickness Inches	Weight Lbs. per Foot (Approx.)	Dimen- sions Inches	Thickness Inches	Weight Lbs. per Foot (Approx.)
1/4 x 1/4	.0453	.08	3/4 x 3/4	.0625	.33
$3/8 \times 1/4$.03125	.07	$3/4 \times 3/4$.0453	.24
$3/8 \times 3/8$.0625	.16	1 x 1	.0640	.45
$3/8 \times 3/8$.0453	.13	1 x 1	.0625	.45
3/8 x 1/2	.03125	.10	1 x 1	.0453	.32
1/2 x 1/2	.0640	.22	1 1/4 x 1 1/4	.0625	.57
1/2 x 1/2	.0625	.22	1 1/4 x 1 1/4	.0453	.41
$1/2 \times 1/2$.0453	.16	1 1/2 x 1 1/2	.0625	.66
5/8 x 5/8	.0453	.21	1 1/2 x 1 1/2	.0453	.49
3/4 x 3/4	.0640	.33	2 x 2	.0625	.89

EXTRUDED—HALF HARD In 12 to 14 foot Mill Lengths

Outside Dimen- sions Inches	Thi	ickness Decimal Equivalent Inches	Weight Lbs. per Lin. Ft. (Approx.)	Outside Dimen- sions Inches	Thi	ickness Decimal Equivalent Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/2 x 1/2 3/4 x 3/4 1 x 1 1 1/4 x 1 1/4 1 1/2 x 1 1/2	1/8 1/8 1/8 1/8 1/4 3/16	.125 .125 .125 .125 .250	.40 .66 .87 1.09 2.53	1 1/2 x 1 1/2 2 x 2 2 1/2 x 2 1/2 3 x 3	1/8 1/4 3/16 1/8 1/4 1/4	.125 .250 .1875 .125 .250	1.32 3.40 3.20 1.78 4.37 5.30

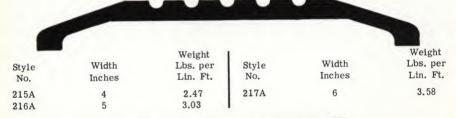
BRASS CHANNELS

DRAWN-HALF HARD
In 12 to 14 foot Mill Lengths

1/4 x 1/4 x 1/4	.0403	.098	1	3/8 x 5/8 x 3/8	.0403	.190
3/8 x 3/8 x 3/8	.0403	.154		$3/8 \times 3/4 \times 3/8$.0403	.208
$3/8 \times 1/2 \times 3/8$.0403	.172		$3/4 \times 3/8 \times 3/4$.0403	.308

CORRUGATED TOP BRASS DOOR SADDLES

In 16-foot Mill Lengths



TOLERANCES FOR BRASS AND BRONZE SHAPES

Shapes (Except Hot Rolled Shapes and Shapes for Forging Purposes, for which no tolerances are established) ...1/2" maximum curvature (depth of arc) in any 6-foot portion of the total length.

COPPER

BAR AUTOMOTIVE TUBE

ROD BUS CONDUCTOR TUBE

SHEET EVAPORATIVE COOLER

STRIP SERVICE TUBE

PLATE OIL BURNER TUBE

ROLL REFRIGERATION TUBE

PIPE WATER TUBE

COMMERCIAL TUBE

WIRE

ACR TUBE

DWV TUBE

BRASS-COPPEPSIALLESS

CHASE METALS SERVICE

COPPER INDEX

Copper Numbers are those assigned to each type of copper by Copper & Brass Research Association, and adopted as Standard Identification by the Industry

ROD & BAR 1-11	TUBE (Cont'd)
Data 8-11 Electrolytic Tough Pitch,	Bus Conductor Tube, Square, Copper No. 120 39
Copper No. 110 2-5,7	Copper Water Tube 30-34
Tellurium Copper,	DWV Tube 34
Copper No. 145 6-7	Evaporative Cooler Service Tube,
SHEET, STRIP & ROLL12-25	Copper No. 122
Data	High Phosphorus Copper Tube, Copper No. 122 27-39
Beryllium Copper Strip, Copper No. 172 19-20	Low Phosphorus Copper Tube, Copper No. 120 40
Crimped Copper Sheet 17	Oil Burner Tube,
Electrolytic Tough Pitch, Copper No. 110	Copper No. 122
Flat Sheets & Strips 13-16 Rolls	Refrigeration Tube, Copper No. 122
Lead Coated Copper Sheet 17	
Utility Copper Strip 16	PIPE
TUBE 26-56	Data 50, 52, 53
Data	Low Phosphorus Copper, Copper No. 120 40-41
ACR Tube, Copper No. 122 37,38	Threadless Pipe, Copper No. 122 41
Automotive Tube, Copper No. 122 39	<u>WIRE</u>





COPPER ROD AND BAR



Chase Metals Service stocks a wide range of thicknesses and widths of rectangular copper bar in standard mill lengths. Carried in stock are hard drawn, square edge, from 1/16-inch thick to $2\ 1/2$ inches thick, with widths in some sizes up to 6" and 8". Hard drawn with full rounded edges or rounded edges is stocked in 1/16" to 5/8" thick, and up to 6" wide.

Square is stocked in diameters from 3/16" to 3", and round in 1/8" to 4" diameter.

That means you can get prompt delivery of practically any size for any application, and less common sizes that may not be in stock can be obtained for you promptly from available mill stocks.

Of interest to the fabricator of forgings and screw machine parts requiring high conductivity, is Tellurium copper rod. Its machinability is 90% of that of Free-Cutting Brass, and its electrical conductivity 95% of that of copper. It is ideally suited for electrical connectors, motor and switch parts, soldering coppers and welding torch tips.

ELECTROLYTIC TOUGH PITCH COPPER ROD AND BAR

COPPER NO. 110

CHEMICAL COMPOSITION*

Copper, 99.9% min.

Oxygen, 0.04%

Electrolytic Tough Pitch Copper Rod and Bar are well suited to the broad electrical field. They can be fabricated by hot or cold bending, heading and stamping. They are employed for numerous electrical uses including bus conductors, electrical connectors and switchgear.

FABRICATION PROPERTIES*

	Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing Good Oxyacetylene Welding . Not Recommended Carbon Arc Welding . Fair Gas Shielded Arc Welding . Fair Coated Metal Arc Welding . Not Recom. Resistance Welding: Spot Not Recommended Seam Not Recommended Butt Good
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MECHANICAL PROPERTIES*

	1'' Hard (35%
Tensile Strength, p.s.i.	48,000
Yield Strength, p.s.i.	44,000
Shear Strength, p.s.i.	27,000
Elongation, % in 2-in.	16
Rockwell Hardness	F87, B47

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1949	Liquidus 1981
Density, lbs., per cu. in. @ 68F.	0.321-0.323
Specific gravity	8.89-8.94
Coefficient of Thermal Expansion	0.0000098 per °F. from 68F. to 572F.
Thermal Conductivity	226 Btu./sq.ft./ft./hr./°F. @ 68F.
Electrical Resistivity (Annealed)	103 Ohms (circ. mil./ft.) @ 68F.
Electrical Conductivity (Annealed)	101 % IACS @ 68F.
Thermal Capacity (Specific Heat)	0.092 Btu./lb./°F @ 68F.
Modulus of Elasticity (Tension)	17,000,000 psi
Modulus of Rigidity	6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	
A.S.T.M.	B187, B124, Alloy #12
A.M.S.	
Federal	QQ-C-5026 Amend. #4
Military	MIL-C-12166 (ORD.)

^{*}All Values nominal. Not to be used as specification requirements.





COPPER BAR

COPPER NO. 110

RECTANGULAR-HARD DRAWN-SQUARE EDGE

In Standard 12-foot Mill Lengths

Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/16 1/16 1/16 1/16 1/16	3/8 1/2 5/8 3/4 7/8	.0908 .121 .151 .182 .212	1/4 1/4 1/4 1/4 1/4	5/8 3/4 7/8 1 1 1/8	.606 .727 .848 .969
1/16	$ \begin{array}{c} 1\\2\\1/2\\3/8\\1/2 \end{array} $.242	1/4	1 1/4	1.21
1/16		.484	1/4	1 1/2	1.45
5/64		.151	1/4	1 3/4	1.70
3/32		.136	1/4	2	1.94
3/32		.182	1/4	2 1/4	2.18
3/32	5/8	.227	1/4	2 1/2	2.42
3/32	3/4	.273	1/4	3	2.91
3/32	1	.363	1/4	3 1/4	3.13
3/32	1 1/4	.454	1/4	3 1/2	3.39
3/32	1 1/2	.545	1/4	4	3.88
1/8	1/4	.121	1/4	5	4.84
1/8	3/8	.182	1/4	6	5.81
1/8	1/2	.242	1/4	8	7.75
1/8	5/8	.303	5/16	1/2	.606
1/8	3/4	.363	5/16	3/4	.908
1/8 1/8 1/8 1/8 1/8	7/8 1 1 1/4 1 1/2 1 3/4	.424 .484 .605 .726	5/16 5/16 5/16 5/16 5/16 3/8	1 1 1/4 1 1/2 2 1/2	1.21 1.52 1.82 2.42 .727
1/8	2	.969	3/8	5/8	.908
1/8	2 1/2	1.21	3/8	3/4	1.09
1/8	3	1.45	3/8	1	1.45
1/8	4	1.94	3/8	1 1/4	1.81
5/32	1 1/4	.757	3/8	1 1/2	2.18
3/16	3/8	.273	3/8	2	2.91
3/16	1/2	.363	3/8	2 1/2	3.64
3/16	5/8	.454	3/8	3	4.36
3/16	3/4	.545	3/8	4	5.81
3/16	7/8	.636	3/8	6	8.72
3/16 3/16 3/16 3/16 3/16	1 1 1/4 1 1/2 1 3/4	.727 .909 1.09 1.27 1.45	1/2 1/2 1/2 1/2 1/2 1/2	3/4 1 1 1/4 1 1/2 1 3/4	1.45 1.94 2.42 2.91 3.39
3/16 3/16 3/16 7/32 1/4 1/4	2 1/2 3 4 1 3/8 1/2	1.81 2.18 2.91 .848 .363 .484	1/2 1/2 1/2 1/2 1/2 1/2 1/2	2 2 1/2 3 3 1/2 4 6	3.88 4.85 5.81 6.78 7.75

Continued



COPPER BAR

COPPER NO. 110

RECTANGULAR-HARD DRAWN-SQUARE EDGE

In Standard 12-Foot Mill Lengths
Continued

Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
5/8 5/8 5/8 5/8 3/4	3/4 1 1/2 4 6	1.82 3.64 9.70 14.5 2.91	1 1 1 1 1/4 1 1/4	4 5 6 1 1/2 3	15.5 19.4 23.3 7.27 14.5
3/4 3/4 3/4 3/4	1 1/4 1 1/2 2 2 1/2 2 3/4	3.63 4.36 5.82 7.27 8.00	1 1/4 1 1/4 1 3/8 1 1/2 1 1/2	3 1/2 4 2 2 2 1/2	17.0 19.4 10.7 11.6 14.5
3/4 3/4 3/4 3/4	3 3 1/2 4 7 1 1/4	8.72 10.2 11.6 20.4 4.85	1 1/2 1 1/2 1 3/4 1 3/4 2	3 4 2 3 2 1/2	17.4 23.3 13.6 20.3 19.4
1 1 1	1 1/2 2 2 1/2 3	5.82 7.75 9.69 11.6	2 2 2 1/2	3 4 3	23.2 31.0 29.1

RECTANGULAR-HARD DRAWN-WITH FULL ROUNDED EDGES

(Most Listed Sizes Also Available with Rounded Edges)

	(Most List	ed Sizes Also Av	allable with Rounde	ed Edges)	
1/16	1/2	.121	1/8	5/8	.303
1/16	5/8	. 151	1/8	3/4	.363
1/16	3/4	. 182	1/8	7/8	.424
1/16	1	.242	1/8	1	.484
1/16	2	.484	1/8	1 1/4	.605
1/16	3	.726	1/8	1 3/8	.666
3/32	3/8	.136	1/8	$1 \ 1/2$. 726
3/32	1/2	.182	1/8	1 3/4	.848
3/32	9/16	.204	1/8	2	. 969
3/32	3/4	.273	1/8	2 1/2	1.21
3/32	7/8	.323	5/32	5/8	.379
3/32	1 1/2	. 545	5/32	3/4	. 454
3/32	3	1.09	5/32	2 1/8	1.289
1/8	3/8	. 182	3/16	9/16	.409
1/8	7/16	.212	3/16	5/8	. 454
1/8	1/2	.242	0/10		707
1/8	9/16	.273	3/16	1 1/0	.727
		Cont	3/16 tinued	1 1/8	.818





COPPER BAR

COPPER NO. 110

RECTANGULAR-HARD DRAWN-WITH FULL ROUNDED EDGES
(Most Listed Sizes Also Available with Rounded Edges)

In Standard Mill Lengths Continued

Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Thickness Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
3/16	1 1/2	1.09	1/4	4	3.88
3/16	1 3/4	1.27	1/4	5	4.84
3/16	2	1.45	1/4	6	5.81
3/16	2 1/4	1.63	9/32	1	1.09
3/16	2 5/8	1.904	5/16	1 1/4	1.52
3/16	4	2.91	5/16	1 3/4	2.12
13/64	1	.710	5/16	2	2.42
1/4	3/8	.363	5/16	2 1/2	3.04
1/4	1/2	.484	5/16	3	3.63
1/4	5/8	.606	3/8	1	1.45
1/4	3/4	.727	3/8	1 1/2	2.18
1/4	7/8	.848	3/8	1 3/4	2.54
1/4	1	.969	3/8	2	2.91
1/4	1 1/4	1.21	3/8	2 1/4	3.27
1/4	1 1/2	1.45	3/8	3	4.36
1/4 1/4 1/4 1/4 1/4 1/4	1 3/4 2 2 1/4 2 1/2 3 3 1/2	1.70 1.94 2.18 2.42 2.91 3.39	3/8 1/2 1/2 1/2 1/2 1/2 5/8	3 /4 2 1/2 3 4 3 1/2	5.81 1.45 4.85 5.81 7.75 8.48

COPPER ROD

COPPER NO. 110

ROUND-HARD DRAWN

In Standard Mill Lengths

1/8	.125	.0476	1 1/4	1.250	4.76
5/32	.156	.0743	1 3/8	1.375	5.76
3/16	.188	. 107	1 1/2	1.500	6.85
1/4	.250	. 190	1 5/8	1.625	8.04
5/16	.312	.297	1 3/4	1.750	9.32
3/8	.375	.428	1 7/8	1.875	10.7
7/16	.438	. 583	2	2.000	12.2
1/2	.500	.761	2 1/4	2.250	15.4
9/16	.562	. 963	2 1/2	2.500	19.0
5/8	.625	1.19	2 3/4	2.750	23.0
3/4	.750	1.71	3	3.000	27.4
7/8	.875	2.33	3 1/4	3.250	32.2
15/16	.938	2.68	3 1/2	3.500	37.3
1	1.000	3.04	4	4.000	48.7
1 1/8	1.125	3.85	1		



TELLURIUM COPPER ROD

COPPER NO. 145

CHEMICAL COMPOSITION*

Copper, 99.5%

Tellurium, 0.5%

Phosphorus, 0.01%

Tellurium Copper is quite similar to copper in most respects, and has high electrical conductivity (95% IACS [Annealed]) but in addition is highly machinable. Compared with the machinability of Free-Cutting Brass which is rated 100, Tellurium Copper is rated 90. It is used for forgings and screw machine parts requiring high conductivity, furnace brazing, extensive machining, corrosion resistance, copper color, or a combination of these. Also electrical connectors, motor and switch parts, soldering coppers, welding torch tips,

FARRICATION PROPERTIES*

MECHANICAL PROPERTIES*

	1/4" Half Hard	1/4" Half Hard	1/2" Half Hard	1/2" Half Hard
	(20%)	(45%)	(20%)	(35%)
Tensile Strength, p.s.i.	44,000	53,000	43,000	48,000
Yield Strength, p.s.i.	41,000	49,000	40,000	44,000
Shear Strength, p.s.i.	26,000	29,000	26,000	27,000
Elongation, % in 2-in.	15	10	20	15
Rockwell Hardness	B43	B54	B43	B48

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus Density, lbs., per cu. in. @ 68F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

Liquidus 1980

0.323 8.94

0.0000099 per °F, from 68F, to 572F. 212 Btu./sq.ft./ft./hr./°F. @ 68F.

95 % IACS @ 68F.

17,000,000

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. B301 A.M.S. Federal Military

^{*}All Values nominal. Not to be used as specification requirements.



COPPER ROD

COPPER NO. 110

ROUND-SOFT TEMPER

In Standard Mill Lengths

Dian	neter	Weight	Dian	neter	Weight
Inches	Decimal Equivalent Inches	Lbs. per Lin. Ft. (Approx.)	Inches	Decimal Equivalent Inches	Lbs. per Lin. Ft. (Approx.)
5/16	.312	.297		• • •	• • •

COPPER BAR

COPPER NO. 110

SQUARE-HARD DRAWN

In Standard Mill Lengths

3/16	.188	.136	1	1.000	3.88
1/4	.250	.242	1 1/4	1.250	6.06
5/16	.312	.379	1 1/2	1.500	8.72
3/8	.375	. 545	1 3/4	1.750	11.9
1/2	. 500	.969	2	2.000	15.5
5/8	. 625	1.51	2 1/2	2.500	24.2
3/4	.750	2.18	3	3.000	34.9
7/8	875	2.97			

TELLURIUM COPPER ROD

COPPER NO. 145

(For Data, See Preceding Page)

ROUND-HALF HARD

In Standard Mill Lengths

1/8	.125	.048	7/8	.875	2.33
3/16	.188	.107	15/16	.938	2.68
1/4	.250	.190	1	1.000	3.04
5/16	.312	.297	1 1/8	1.125	3.85
3/8	.375	.428	1 1/4	1.250	4.76
7/16	.438	. 583	1 5/16	1.312	5.24
1/2	. 500	.761	1 3/8	1.375	5.76
9/16	.562	.963	1 1/2	1.500	6.85
5/8	. 625	1.19	1 3/4	1.750	9.32
11/16	.688	1.44	2	2.000	12.2
3/4	. 750	1.71	2 1/8	2.125	13.7
13/16	.812	2.01	2 1/2	2.500	19.0

HEXAGONAL-HALF HARD

In Standard Mill Longtha

		In Standard	Mill Lengths		
3/8	.375	.472	11/16	.688	1.59
7/16	.438	. 643	3/4	.750	1.89
1/2	. 500	.839	7/8	.875	2.57
17/32	. 5312	.947	1	1.000	3.36
9/16	.5625	1.06	1 1/8	1.125	4.25
5/8	.625	1.31			

TOLERANCES For Copper Rod & Bar

ROD

COLD DRAWN TO FINAL SIZE

TOLERANCES ON DIAMETER OR DISTANCE BETWEEN PARALLEL SURFACES
In Inches

The following tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.

The tolerances for rod up to 0.150", inclusive, in this table, are greater (than for similar sizes in wire, but are required by dimensional changes resulting from the straightening operation, which changes are negligible in sizes over 0.150".

Diameter or Distance	Copper	
between Parallel Surfaces in Inches	Round	Hexagonal Octagonal
Up to .150 inclusive Over .150 to .500 inclusive Over .500 to 1.00 inclusive Over 1.00 to 2.00 inclusive Over 2.00	.0013 .0015 .002 .0025 0.15%*	.0025 .003 .004 .005 0.30%*

^{*}Expressed to the nearest 0.001"

ROD LENGTH TOLERANCES

In Inches

Tolerances are all plus. If all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

Lengths	Applicable Only to Full Length Pieces
Specific Lengths	3/8
Specific Lengths with Ends	1

SCHEDULE OF SHORT LENGTHS-ROD

Applicable to specific lengths with ends

Round, Hexagonal, Octagonal Diameter or Distance Between Parallel Surfaces in Inches	Indicated Length in Feet	Minimum Length* of Shortest Piece in % of Indicated Length	Maximum Permissible Weight of Ends in % of Lot Weight
Up to 1/2 inclusive	6 to 14 incl.	75	20
Over 1/2 to 1 inclusive	6 to 14 incl.	70	30
Over 1 to 1 1/2 inclusive	6 to 12 incl.	60	40
Over 1 1/2 to 2 inclusive	6 to 12 incl.	50	40
Over 2 to 3 inclusive	6 to 10 incl.	40	50

^{*}Expressed to nearest 1/2 foot

DATA

TOLERANCES FOR COPPER ROD

STRAIGHTNESS TOLERANCES

Applicable to any longitudinal surface or edge

DI COULT ICC																		
Length										IV	/Iax	imu		ature (I	-	th of	(Arc)	
(In Feet	t)												(I	n Inches	;)			
Up to 2.	٠.									.1/32								
Incl. 2 to	5.									.1/32	in	any	2-foot	portion	of	the	total lengt	h
Incl. 5 to	10									.1/8	in	any	5-foot	portion	of	the	total lengt	h
10 and a																	total lengt	

TOLERANCES FOR COPPER BAR (Rolled or Drawn)

Includes Squares and Copper Bus Bar Rounded Edges, Square Edges, or Rounded Corners

The following tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.

THICKNESS TOLERANCES (In Inches)

COPPER BAR

							Widt	h in Inches		
THI	CKNE	SS	IN IN	ICHES	Up to 1/2 inc.	Over 1/2 to 1 1/4 incl.		Over 2.00 to 4.00 incl.	Over 4.00 to 8.00 incl.	Over 8.00 to 12.00 incl
Over Over Over Over	.050 .090 .130 .188 .500	to to to	.130	inclusive inclusive inclusive inclusive inclusive	.0015 .002 .0025 .003	.0015 .002 .0025 .003	.002 .0025 .003 .0035 .004	.0025 .003 .0035 .004 .0045		
Over Over		to to	$\frac{2.00}{4.00}$	inclusive inclusive		.0045	.0045	.005 0.30%*	.006	

^{*}Expressed to the nearest .001".

Danier Dod

WIDTH TOLERANCES (In Inches)

For Rectangles (Not Including Squares) (For Squares, use Thickness Tolerances above)

	Width	in	Inches		Copper
Up to Over Over Over Over	.050 .050 .090 .130	to to to	.130	inclusive inclusive inclusive inclusive	.0013 .0015 .002 .003
Over Over Over	.500 1.25 2.00 4.00	to to to	1.25 2.00 4.00 12.00	inclusive inclusive inclusive inclusive	.005 .008 .012 0.30%*

^{*}Expressed to the nearest .001".



TOLERANCES FOR COPPER BAR (Rolled or Drawn)

LENGTH TOLERANCES (In Inches)

(Applicable also to Copper Bus Bar)

Tolerances are all plus. If all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

Lengths	Applicable Only to Full Length Pieces
Specific Lengths	3/8
Specific Lengths with Ends	1

SCHEDULE OF SHORT LENGTHS

Applicable to Specific Lenghts with Ends (Applicable also to Copper Bus Bar)

Square Bars Side in Inches	Rectangular Bars Area* in Square Inches	Indicated Length in Feet	Minimum Length * of Shortest Piece in % of Indicated Length	Maximum Permissible Weight of Ends in% of Lot Weight
Over 1 to 1 1/2 inclusive Over 1 1/2 to 2 inclusive			75 70 60 50 40	20 30 40 45 50

^{*}Expressed to nearest 1/2 foot.

STRAIGHTNESS TOLERANCES

Applicable to any longitudinal edge of material supplied in nominally flat straight lengths.

Bar (Except Copper Bus Bar)

.1/2" maximum edgewise curvature (depth of arc) in any 6-foot portion of the total length.

Copper Bus Bar (except Hard Bus Bar in sizes listed below).1/4" maximum curvature (depth of arc) in any 5-foot portion of the total length.

Hard Bus Bar 1/8" to 5/8" incl., in thickness, ranging from 2" to 6", incl., in width. 1/8" maximum curvature (depth of

1/8" maximum curvature (depth of arc) in any 8-foot portion of the total length.



TOLERANCES FOR COPPER BAR

STANDARD EDGE CONTOURS

(a) SQUARE CORNERS—Unless otherwise specified, the product shall be finished with commercially square corners. The maximum permissible radius to which commercially square corners may be rounded is as follows:

TABLE 1

TABLE I	
Specified Thickness (Inches)	Maximum Radius of Corners Allowable for Square Corners (Inches)
Bar-Over 3/16 to 1 incl	1/32 1/16

(b) ROUNDED CORNERS—When specified, the product may be finished with corners rounded as shown in Fig. 1 to a quarter circle of a radius as shown in Table II. The tolerance on the radius shall be plus and minus 25%. The arc of the rounded corner shall not necessarily be tangent at points "A", but the product shall be commercially free from sharp, rough or projecting edges.



Fig. 1

TABLE II

Specified Thickness	Nominal Radius of Corners (In Inches)					
(In Inches)	For Widths up to and Including 2 x Thickness	For Widths More Than 2 x Thickness				
Bar-Over 3/16 to 1 incl Bar-Over 1	1/16 1/8	1/16 1/8				

(c) ROUNDED EDGE—When specified, the product may be finished with edges rounded as shown in Fig. 2, the radius of curvature being as shown in Table III. The arc of the rounded edge shall be substantially symmetrical with the axis of the product. The corners "A" will usually be sharp but shall not have rough or projecting edges.

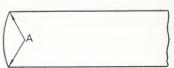


Fig. 2

TABLE III

Specified Thickness (Inches)	Nominal Radius of Rounded Edge	Tolerance on Radius Plus and Minus
Bar-Over 3/16	11/4 times Thickness	1/4 times Thickness

(d) FULL ROUNDED EDGE—When specified, the product may be finished with substantially uniform round edges, the radius of curvature being approximately one-half the thickness of the product, as shown in Fig. 3, but in no case to exceed one-half the thickness of the product by more than 25%. The arc of the rounded edge shall not necessarily be tangent at

points "A" but shall be substantially symmetrical with the axis of the product, and the product shall be commercially free from sharp, rough or projecting edges.

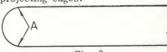


Fig. 3

Note-Products with edge or corner contours other than shown above are classified as shapes.

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.

COPPER 11.





SHEET, STRIP and ROLL COPPER



Large and varied stocks of copper sheet and strip are carried by Chase Metals Service Centers for prompt delivery either to your shop or directly to the job. We can also furnish tinned or lead coated copper sheet from stock.

Copper sheet and strip (either flat or in rolls) are adaptable to many fabrication processes. In addition to the usual spinning, stamping and drawing operations, copper is used for tank work, heat exchanger units, novelty production, and because of its remarkable corrosion-resistant qualities, for roofing and flashing work.

Chase copper is 99.9% pure, making it more durable. Impurities in copper can result in pin holes, cracks and fractures—a definite factor in the life of sheet copper work.

For shipping weights of sheet copper and for advice on the correct tempers of roofing copper, see under Data, this section.

ELECTROLYTIC TOUGH PITCH COPPER SHEET AND STRIP

COPPER NO. 110

(For Stock Listings, See Following Pages.)

CHEMICAL COMPOSITION*

Copper, 99.9 min.

Oxygen, 0.04%

Electrolytic Tough Pitch Copper, a long-standing standard type of commercial wrought copper, is entirely satisfactory for most general applications. Its capacity for both cold and hot working is excellent and it can be fabricated by most processes. Used for numerous electrical applications, automobile radiators, building sheet metal, vats, kettles, gaskets, ball floats, transformer windings and tacks.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing Good Oxyacetylene Welding Not Recommended Carbon Arc Welding Fair Gas Shielded Arc Welding Fair Coated Metal Arc Welding Not Recom. Resistance Welding: Spot Not Recommended Seam Not Recommended
Annealing Temperature	Seam Not Recommended Butt

MECHANICAL PROPERTIES* (all 0.040 gauge strip)

	0.025 mm Anneal	Hard (37%)
Tensile Strength, p.s.i.	34,000	50,000
Yield Strength, p.s.i.	11,000	45,000
Shear Strength, p.s.i.	23,000	28,000
Elongation, % in 2-in.	45	6
Rockwell Hardness	F45	F90, B50, 31(30T)

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1949	Liquidus 1981
Density, lbs., per cu. in. @ 68 F.	0.321-0.323
Specific gravity	8.89-8.94
Coefficient of Thermal Expansion	0.0000098 per °F. from 68 F. to 572 F.
Thermal Conductivity	226 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	10.3 Ohms (circ. mil./ft./ @ 68 F.
Electrical Conductivity (Annealed)	101 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.092 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	17,000,000
Modulus of Rigidity	6,400,000

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	71
A.S.T.M.	B152, Type ETP
A.M.S.	4500D
Federal	QQ-C-576a
Military	

*All Values nominal. Not to be used as specification requirements.



FLAT PLAIN COPPER SHEET

ELECTROLYTIC TOUGH PITCH COPPER-COPPER NO. 110 (For Data, See Preceding Page)

HOT ROLLED (SOFT)

In Exact Sizes as Listed

Weight		Size	Weight	Weight	m : 1	Size	Weight
per	Thickness	of Sheet	Lbs. per	per	Thickness	of Sheet	Lbs. per
Square	in	in		Square	in	in	Sheet
Foot	Inches	Inches	(Approx.)	Foot	Inches	Inches	(Approx.)
8 oz.	.0108	30 x 60	6.25	38 oz.	.0512	30 x 60	29.7
14 oz.	.0189	30×96	17.5	38 oz.	.0512	30×96	47.5
14 oz.	.0189	36×96	21.0	40 oz.	.0539	30×60	31.3
16 oz.	.0216	20×96	13.3	40 oz.	.0539	36×96	60.0
16 oz.	.0216	24 x 96	16.0	40 oz.	.0539	48 x 72	60.0
16 oz.	.0216	24 x120	20.0	40 oz.	.0539	48 x120	100.0
16 oz.	.0216	28×96	18.7	48 oz.	.0647	24×48	24.0
16 oz.	.0216	30×60	12.5	48 oz.	.0647	30×60	37.5
16 oz.	.0216	30×96	20.0	48 oz.	.0647	30×96	60.0
16 oz.	.0216	30 x120	25.0	48 oz.	.0647	36×72	54.0
16 oz.	.0216	36 x 96	24.0	48 oz.	.0647	36 x 96	72.0
16 oz.	.0216	36 x120	30.0	48 oz.	.0647	36×120	90.0
16 oz.	.0216	48 x 72	24.0	48 oz.	.0647	48×72	72.0
16 oz.	.0216	48 x 96	32.0	48 oz.	.0647	48×96	96.0
18 oz.	.0243	24 x 96	18.0	48 oz.	.0647	48 x120	120.0
18 oz.	.0243	30 x 96	22.5	48 oz.	.0647	60 x120	150.0
18 oz.	.0243	36×96	27.0	3 1/2 lb.	.0755	48×72	84.0
20 oz.	.0270	24 x 96	20.0	4 lb.	.0863	30×60	50.0
20 oz.	.0270	30 x 60	15.6	4 lb.	.0863	36×96	96.0
20 oz.	.0270	30×96	25.0	4 lb.	.0863	48×72	96.0
20 oz.	.0270	36 x 96	30.0	4 lb.	.0863	48 x 96	128.0
20 oz.	.0270	36 x120	37.5	4 lb.	.0863	48 x120	160.0
20 oz.	.0270	48 x 72	30.0	4 lb.	.0863	60×120	200.0
24 oz.	.0323	24 x 96	24.0	4 1/2 lb.	.0972	48×72	108.0
24 oz.	.0323	30×60	18.8	5 lb.	.108	30×60	62.5
24 oz.	.0323	30 x 96	30.0	5 lb.	.108	48 x 72	120.0
24 oz.	.0323	36 x 72	27.0	5 lb.	.108	48 x 96	160.0
24 oz.	.0323	36 x 96	36.0	5 lb.	.108	48 x120	200.0
24 oz.	.0323	36 x120	45.0	5 lb.	.108	60x120	250.0
24 oz.	.0323	48 x 72	36.0	6 lb.	.129	24×48	48.0
24 oz.	.0323	48 x 96	48.0	6 lb.	.129	30 x 60	75.0
26 oz.	.0350	30 x 60	20.3	6 lb.	.129	36×96	144.0
28 oz.	.0377	30 x 60	21.9	6 lb.	.129	48×72	144.0
28 oz.	.0377	36×96	42.0	6 lb.	.129	48 x 96	192.0
32 oz.	.0431	36 x120	60.0	6 lb.	.129	48 x120	240.0
32 oz.	.0431	24 x 96	32.0	6 lb.	.129	60 x120	300.0
32 oz.	.0431	30×60	25.0	7 lb.	.151	48 x 72	168.0
32 oz.	.0431	30×72	30.0	8 lb.	.173	48×72	192.0
32 oz.	.0431	30 x 96	40.0	9 lb.	.194	48×72	216.0
32 oz.	.0431	36 x 96	48.0	9 lb.	.194	48 x120	360.0
32 oz.	.0431	48 x 72	48.0	12 lb.	.259	48 x 72	288.0
32 oz.	.0431	48 x 96	64.0	12 lb.	.259	48 x120	480.0
32 oz.	.0431	48 x120	80.0	*30 lb.	.0539	30 x 60	30.0
36 oz.	.0485	30 x 96	45.0	*30 lb.	.0539	30 x 96	48.0
36 oz.	.0485	36 x 96	54.0	*50 lb.	.0863	30 x 96	80.0

^{*}Weight based on 12 1/2 square feet or full sheet 30 x 60 inches.





FLAT PLAIN COPPER SHEET

ELECTROLYTIC TOUGH PITCH COPPER-COPPER NO. 110 (For Data, See Page 13, this Section)

HOT ROLLED (SOFT)

In Exact Sizes as Listed Continued

	Size	Weight		Size	Weight
	of Sheet	Lbs. per		of Sheet	Lbs. per
Thickness	in	Sheet	Thickness	in	Sheet
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
1/4	24 x 60	116.0	1/8	36 x 96	139.0
1/4	30 x120	290.0	1/8	48 x 96	185.0
1/4	36 x 96	278.0	3/32	30 x 60	54.3
1/4	72 x 96	556.0	3/32	36 x 96	104.0
1/4	72 x120	695.0	.071	36 x 96	79.0
3/16	36 x 96	208.0	1/16	30 x 60	36.2
3/16	48 x 96	278.0	1/16	36 x 96	69.6
1/8	30 v 60	72.5			

COLD ROLLED

		I	n Exact Size	es as Listed			
Weight		Size	Weight	Weight		Size	Weight
per	Thickness	of Sheet	Lbs. per	per	Thickness	of Sheet	Lbs. per
Square	in	in	Sheet	Square	in	in	Sheet
Foot	Inches	Inches	(Approx.)	Foot	Inches		(Approx.)
10 oz.	.0135	30 x 60	7.81	20 oz.	. 0270	36 x120	37.50
12 oz.	.0162	30 x 60	9.38	24 oz.	.0323	24×96	24.00
12 oz.	.0162	30 x 96	15.00	24 oz.	.0323	24 x120	30.00
12 oz.	.0162	36 x 96	18.00	24 oz.	.0323	30 x 60	
14 oz.	.0189	30 x 96	17.50	24 oz.	.0323	30 x 96	30.00
14 oz.	.0189	36 x 96	21.00	24 oz.	.0323	30 x120	37.50
16 oz.	.0216	20 x 96	13.33	24 oz.	.0323	36 x 96	
16 oz.	.0216	24 x 96	16.00	24 oz.	.0323	36 x120	
16 oz.	.0216	24 x120	20.00	24 oz.	.0323	48 x 96	
16 oz.	.0216	30 x 60	12.50	28 oz.	.0377	30 x 96	35.00
16 oz.	.0216	30 x 96	20.00	32 oz.	.0431	30 x 96	
16 oz.	.0216	30 x120	25.00	32 oz.	.0431	30 x120	
16 oz.	.0216	36 x 96	24.00	32 oz.	.0431	36 x 96	
16 oz.	.0216	36 x120	30.00	32 oz.	.0431	36 x120	
16 oz.	.0216	48 x 96	32.00	32 oz.	.0431	48 x 96	64.00
16 oz.	.0216	48 x120	40.00	32 oz.	.0431	48 x120	
18 oz.	.0243	24 x 96	18.00	36 oz.	.0485	30 x 96	
18 oz.	.0243	30 x 96	22.50	36 oz.	.0485	36 x 96	
18 oz.	.0243	36 x 96		38 oz.		36 x 96	
18 oz.	.0243	36 x120	33.75	40 oz.	.0539	36 x 96	60.00
20 oz.	. 0270	24 x 96		48 oz.	.0647	30 x 96	
20 oz.	.0270	24 x120	25.00	48 oz.		36 x 96	
20 oz.	.0270	30 x 96	25.00	48 oz.	.0647	48 x 96	
20 oz.	.0270	30 x120		48 oz.	.0647	48 x120	
20 oz.	.0270	36 x 96	30.00	*55 lb.	.0972	30 x 60	55.00
	* Weight bas	sed on 12	1/2 square	feet or full	sheet 30 x	60 inches.	

Thickness Inches	Size of Sheet in Inches	Weight Lbs. per Sheet (Approx.)	Thickness Inches	Size of Sheet in Inches	Weight Lbs. per Sheet (Approx.)
1/4	36 x 96	278.4	1/8	36 x120	175.0
1/8	30 x 96	116.0	3/32	36 x 96	104.0
1/8	36 x 96	139.2	.081	36 x 96	90.0

Sizes other than listed can be furnished from Mill stocks.

COPPER 15.



FLAT PLAIN COPPER STRIP

ELECTROLYTIC TOUGH PITCH COPPER-COPPER NO. 110 (For Data, See Page 13, this Section)

COLD ROLLED-FOR GENERAL SHEET METAL WORK

In Exact Sizes as Listed

Weight	Thickness	S:	Weight per Sheet Pounds	Weight	Thickness	Size	Weight per Sheet Pounds
Square	in	Size		Square	in		
Foot	Inches	Inches	(Approx.)	Foot	Inches	Inches	(Approx.)
16 oz.	.0216	9 x120	7.50	16 oz.	.0216	18 x 96	12.0
16 oz.	.0216	10 x 96	6.66	16 oz.	.0216	18 x120	15.0
16 oz.	.0216	10 x120	8.30	16 oz.*	.0216	20 x 96	13.3
16 oz.	.0216	12 x 96	8.00	16 oz.	.0216	20 x120	16.0
16 oz.	.0216	14 x 96	9.33	24 oz.	.0323	12 x 96	12.0
16 oz.	.0216	15 x 96	10.0	48 oz.	.0647	12 x 96	24.0
16 oz.	.0216	16 x 96	10.7	1			

^{*} Also available in Soft Temper.

HALF HARD TEMPER

In 10-foot Mill Lengths

Thickness Inches	Width Inches	Weight per Sheet Pounds (Approx.)	Thic Inches & B. & S. Gauge	Decimal Equivalent Inches	Width Inches	Weight per Sheet Pounds (Approx.)
1/2 3/8 5/16 1/4 3/16	12 12 12 12 12	233. 174. 145. 116. 87.2	1/16 No. 12 No. 16 No. 18 No. 20	.0625 .0808 .0508 .0403 .0320	12 12 12 12 12	29.1 37.5 23.6 18.7 14.8
1/8 3/32	12 12	58.1 43.4	No. 22 No. 24	.0253	12 12	11.7 9.32

UTILITY COPPER STRIP

ELECTROLYTIC TOUGH PITCH COPPER-COPPER NO. 110

Used Mainly for Manufacture of Roofing Gutters and Downspouts

COLD ROLLED

In Exact Sizes as Listed

Weight per Square Foot	Thickness	Size Inches	Weight per Strip Pounds (Approx.)	Weight per Square Foot	Thickness in Inches	Size Inches	Weight per Strip Pounds (Approx.)
16 oz. 16 oz. 16 oz. 16 oz. 16 oz.	.0216 .0216 .0216 .0216 .0216	7 x 120 9 x 120 9 5/8 x 120 9 7/8 x 120 10 x 120	5.84 7.50 8.02 8.23 8.33	16 oz. 16 oz. 16 oz. 16 oz. 16 oz.	.0216 .0216 .0216 .0216 .0216	12 x 120 13 1/8 x 120 13 5/16 x 120 14 x 120 15 x 120	10.0 10.9 11.1 11.7 12.5
16 07	0216	$10.5/8 \times 120$	8.85				

Number of Sheets per Case

7 to 9 inch widths inclusive, 100 sheets.

9 3/4 to 12 inch widths inclusive, 75 sheets.

13 3/16 inches wide and over, 50 sheets.



CRIMPED COPPER SHEET

FIECTROLYTIC TOUGH PITCH COPPER-COPPER NO. 110

COLD BOLLED

In Exact Sizes as Listed

Weight per Square Foot	Thickness in Inches	Size Inches	Weight per Sheet Pounds (Approx.)	Weight per Square Foot	Thickness in Inches	Size Inches	Weight per Sheet Pounds (Approx.)
16 oz.	.0216	30 x 96 36 x 96	20.0 24.0	16 oz.	.0216	36 x120	30.0

LEAD COATED COPPER

All Chase Copper Sheet and Strip can be furnished lead coated. Lead coated copper has the neutral gray coloring of solid lead and the added advantages of lightness, easyworking qualities and lower basic cost.

Description of Finish

Chase Commercial-Standard

Coated with approximately 12 to 15 pounds of lead per 100 square feet applied on both sides of the sheet (6 to $7\,1/2$ pounds per side).

FLAT COPPER SHEET

COLD ROLLED-LEAD COATED BOTH SIDES*

In Exact Sizes as Listed

Weight per Square Foot	Thickness in Inches	Size Inches	Weight† Lbs. per Sheet (Approx.)	Weight per Square Foot	Thickness in Inches	Size Inches	Weight† Lbs. per Sheet (Approx.)
16 oz. 16 oz. 16 oz.	.0216 .0216 .0216	24 x 96 30 x 96 36 x 96 36 x120		20 oz. 20 oz. 24 oz.	.0270 .0270 .0323	30 x 96 36 x 96 36 x 96	

SOFT TEMPER-LEAD COATED BOTH SIDES*

In Exact Sizes as Listed

16 oz.	.0216	24 x 96 30 x 96 36 x 96	20.0	20 oz.		36 x120 36 x 96	
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^{*}N.Y. Service Center stock is Standard Smooth Finish, to New York State specification.

[†]Weights per sheet are approximate weights before lead coating.



COPPER IN ROLLS

ELECTROLYTIC TOUGH PITCH COPPER-COPPER NO. 110 (For Data, See Page 13, this Section)

COLD ROLLED ANNEALED-FOR SPINNING AND STAMPING

B.& S.Gau	ge			B.&S.Gaug	ge		
or Weight			Weight	Weight			Weight
per	Thickness		Lbs.per	per	Thickness		Lbs. per
Square	in	Width	Lin. Ft.	Square	in	Width	Lin. Ft.
Foot	Inches	Inches	(Approx.)	Foot	Inches	Inches	(Approx.)
No. 12	.0808	6	1.860	18 oz.	.0243	14	1.312
No. 12	.0720	6	1.667	18 oz.	.0243	16	1.500
		12	3.000	18 oz.	.0243	18	1.687
48 oz.	.0647			No. 23	.0226	6	.525
No. 14	.0641	4 1/2	1.113	16 oz.	.0216	3	.250
No. 14	.0641	6	1.485	10 02.			
No. 14	.0641	10	2.478	16 oz.	.0216	$3 \ 1/2$. 292
No. 14	.0641	12	2.970	16 oz.	.0216	4	. 334
No. 15	.0571	8	1.764	16 oz.	.0216	6	. 500
No. 16	.0508	6	1.180	16 oz.	.0216	7	. 583
No. 16	.0508	12	2.360	16 oz.	.0216	8	.667
32 oz.	.0431	6	1.000	16 oz.	.0216	10	.833
32 oz.	.0431	8	1.333	16 oz.	.0216	12	1.000
32 oz.	.0431	10	1.667	16 oz.	.0216	14	1.167
32 oz.	.0431	11	1.842	16 oz.	.0216	16	1.333
32 oz.	.0431	12	2.000	16 oz.	.0216	18	1.500
			2.333		.0216	20	1.667
32 oz.	.0431	14		16 oz.		6	
32 oz.	.0431	18	3.000	No. 24	.0201		.466
No. 18	.0403	6	. 935	No. 24	.0201	24	1.864
No. 18	.0403	12	1.870	14 oz.	.0189	8	. 583
No. 18	.0403	14	2.182	14 oz.	.0189	12	.875
No. 18	.0403	18	2.805	14 oz.	.0189	14	1.021
No. 19	.0359	6	.830	14 oz.	.0189	16	1.167
No. 19	.0359	12	1.660	14 oz.	.0189	20	1.560
24 oz.	.0323	6	. 750	12 oz.	.0162	4	.264
24 oz.	.0323	8	1.000	12 oz.	.0162	4 1/4	.266
24 oz.	.0323	12	1.500	12 oz.	.0162	6	. 375
24 oz.	.0323	14	1.750	12 oz.	.0162	8	.500
24 oz.	.0323	16	2.000	12 oz.	.0162	10	.639
24 oz.	.0323	18	2.250	12 oz.	.0162	12	.750
24 oz.	.0323	20	2.500	12 oz.	.0162	14	.875
No. 20	.0320	6	.740	No. 26	.0159	6	.369
		12	1.480	No. 26	.0159	12	.737
No. 20	.0320	6	.660	10 oz.	.0135	12	. 625
No. 21	.0285					14	.729
20 oz.	.0270	6	. 625	10 oz.	.0135	6	.292
20 oz.	.0270	8	.834	No. 28	.0126		
20 oz.	.0270	10	1.040	No. 28	.0126	12	. 584
20 oz.	.0270	12	1.250	8 oz.	.0108	12	. 500
20 oz.	.0270	14	1.458	No. 30	.0100	6	.232
20 oz.	.0270	16	1.667	No. 30	.0100	12	.464
20 oz.	.0270	18	1.875	No. 32	.0080	$10 \ 1/2$. 324
No. 22	.0253	6	.585	No. 32	.0080	12	.371
No. 22	.0253	12	1.170	No. 36	.0050	6	.116
No. 22	.0253	14	1.365	No. 36	.0050	12	.232
18 oz.	.0243	6	. 563	No. 36	.0050	14	.271
18 oz.	.0243	8	.750	No. 36	.0050	16	. 310
18 oz.	.0243	10	. 938	No. 44	.0020	6	.046
18 oz.	.0243	12	1.125	1		_	
20 02.				furnished fro	m Mill stoc	ks.	



COPPER IN ROLLS

ELECTROLYTIC TOUGH PITCH COPPER-COPPER NO. 110

(For Data, See Page 13, this Section)

COLD ROLLED & ANNEALED (Soft)

For Slitting to Customer's Specifications

Weight per Square Foot	Thickness in Inches	Width Inches	Weight per Square Foot	Thickness in Inches	Width Inches
48 oz. 32 oz. 24 oz. 20 oz. 18 oz.	.0647 .0431 .0323 .0270	24 24 24 24 24	16 oz. 14 oz. 12 oz. 10 oz.	.0216 .0189 .0162 .0135	24 24 24 24

SOFT TEMPER

FOR ROOFING AND SHEET METAL WORK Packed 5 or 6 Rolls in Wire-bound Crate (Approximately 500 lbs. Net to Crate) Or on 2000-lb. Skids

Weight per Square	Thickness in Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)	Weight per Square Foot	Thickness in Inches	Width Inches	Weight Lbs. per Lin. Ft. (Approx.)
Foot 16 oz. 16 oz. 16 oz. 16 oz. 16 oz. 16 oz.	.0216 .0216 .0216 .0216 .0216 .0216	4 6 7 8 10 12	.334 .500 .583 .667 .833	16 oz. 16 oz. 16 oz. 16 oz. 16 oz. 16 oz.	.0216 .0216 .0216 .0216 .0216 .0216	14 15 16 18 20 24	1.167 1.250 1.333 1.500 1.667 2.000

BERYLLIUM COPPER STRIP Alloy 25

IN ROLLS-FOR SLITTING TO CUSTOMERS' SPECIFICATIONS (For Data, See Following Page)

SOFT TEMPER

Weight per Square Foot	Thickness in Inches	Width Inches	Weight per Square Foot	Thickness in Inches	Width Inches
No. 20 No. 22 No. 24 No. 26 No. 28	.0320 .0253 .0201 .0159 .0126	6 to 8 6 to 8 6 to 8 6 to 8 6 to 8	No. 30 No. 32 No. 36	.0100 .0080 .0060 .0050	6 to 8 6 to 8 6 to 8 6 to 8
No. 20 No. 22 No. 24 No. 26	.0320 .0253 .0201 .0159	HALF HARI 6 to 8	No. 30 No. 32 No. 36	.0100 .0080 .0060 .0050	6 to 8 6 to 8 6 to 8 6 to 8
No. 28	.0120	0 00 0	a still advalue on	out from wider	stock.

Sizes other than listed can be furnished from Mill stocks or cut from wider stock.



METALS SERVICE

BERYLLIUM COPPER STRIP IN ROLLS

COPPER NO. 172

CHEMICAL COMPOSITION*

Copper, 97.85%

Beryllium, 1.9%

Cobalt. 0.25%

Half Hard

Beryllium Copper Strip, Alloy 25, a heat treatable beryllium copper alloy, attains the highest mechanical properties of any copper base alloy. It is readily formed into complex shapes from any one of several available mill tempers. A simple low temperature heat treatment doubles the mechanical properties and substantially improves its electrical and thermal conductivity.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering
Annealing Temperature	ButtFair

MECHANICAL PROPERTIES*

				nan naru
		Soft Temper	Half Hard	Temper
	Soft Temper	Heat Treated	Temper	Heat Treated
	As Stocked	3 hr. @ 600°F.	As Stocked	2 hrs. @ 600°F.
Tensile Strength, p.s.i.	60-78,000	165-190,000	85-100,000	185-210,000
Yield Strength, p.s.i.	28-36,000	140-175,000	75- 90,000	160-195,000
Shear Strength, p.s.i.	50-60,000	90-100,000	65-75,000	95-110,000
Elongation, % in 2-in.	35-60%	4-10%	5-25%	2-5%
Rockwell Hardness	B45-78;	C36-41;	B88-96;	C39-44;
	30T46-47	30N56-61	30 T74-7 9	30N59-65

PHYSICAL PROPERTIES*

Melting Point, F. Solidus 1600	Liquidus 1800
Density, lbs., per cu. in. @ 68 F.	0.301
Specific gravity	8.26
Coefficient of Thermal Expansion	0.0000094 per °F. from 68 F. to 572 F.
Thermal Conductivity	775 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	54.5 Ohms (circ. mil/ft.) @ 68 F.
Electrical Conductivity (Annealed)	17-19 % IACS @ 68 F. (As Stocked); 22-25% Heat
	Treated

Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

0.10 Btu./lb./°F/@ 68 F. 18,500,000 psi.

7,300,000 psi.

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.

A.S.T.M. B194

4530B, 4532A A.M.S. QQ-C-533 Federal Military MIL-C-6942

^{*}All Values nominal. Not to be used as specification requirements.



SHEET COPPER SHIPPING WEIGHTS

PER CASE

Size 14 oz.		16 oz.		18 oz.		
of	No.	Total	No.	Total	No.	Total
Sheet	of	Wt. Lbs.	of	Wt. Lbs.	of	Wt. Lbs.
Inches	Sheets	(Approx.)	Sheets	(Approx.)	Sheets	(Approx.)
20 x 96	43	503	47	626.5		• • •
24 x 96	45	630	39	624	35	630
30×96	36	630	31	620	28	630
36 x 96	30	630	26	624	23	621

Size	Size 20 oz.		2	24 oz.		32 oz.	
of	No.	Total	No.	Total	No.	Total	
Sheet	of	Wt. Lbs.	of	Wt. Lbs.	of	Wt. Lbs.	
Inches	Sheets	(Approx.)	Sheets	(Approx.)	Sheets	(Approx.)	
20 x 96	38	633	• 0				
24 x 96	31	620	26	624	20	640	
30 x 96	25	625	21	630	16	640	
36 x 96	21	630	17	612	13	624	

SHEET COPPER TEMPERS FOR ROOFING AND FLASHING WORK

In general, the use of Cold Rolled Copper is recommended for all sheet metal work in building construction. Soft copper can be used for batten or standing seam roofing and for caps and through-wall flashing.

Use cold rolled (Hard) copper for all hanging gutters, downspouts, cornices or whereever stiffness is necessary to support or maintain the shape and contour of the work.

All Chase copper sheet and roll are carefully packed or crated so that they cannot be damaged easily in shipment. We take this precaution so that the copper will be ready for immediate use upon arrival.



TOLERANCES For Copper Sheet & Strip-Cold Rolled

With Slit. Slit and Edge Rolled, Sheared, Sawed or Machined Edges

STANDARD THICKNESS TOLERANCES (In Inches)

Not applicable to Condenser Tube Plates, A.S.M.E. Code Tank Plates and Sheets, Copper rolled to weight, Flat Products with Rolled (not previously slit) or Drawn Edges.

The following tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.

			Width in	Inches	7	
Thickness in Inches	Up to 8 incl.	Over 8 to 12 incl.	Over 12 to 14 incl.	Over 14 to 20 incl.	Over 20 to 28 incl.	Over 28 to 36 incl.
Up to .004 incl. Over .004 to .006 incl. Over .006 to .009 incl. Over .009 to .013 incl. Over .013 to .017 incl. Over .017 to .021 incl. Over .021 to .026 incl. Over .026 to .037 incl. Over .037 to .050 incl. Over .050 to .073 incl. Over .073 to .130 incl. Over .130 to .188 incl. Over .188 to .205 incl. Over .205 to .300 incl.	.0003 .0004 .0006 .0008 .0010 .0013 .0015 .002 .002 .0025 .003 .0035 .0035	.0006 .0008 .0010 .0013 .0015 .0018 .002 .002 .0025 .003 .0035 .004 .004	.0006 .0008 .0010 .0013 .0015 .0018 .002 .002 .0025 .003 .0035 .004 .004	.0013 .0015 .0018 .002 .002 .0025 .0025 .0035 .004 .0045 .0045	.0025 .0025 .003 .003 .0035 .004 .005	.003 .003 .0035 .0035 .004 .005 .006 .007 .008
Over .300 to .500 incl. Over .500 to .750 incl.	.0045	.005	.005	.006	.012	.013

For Copper Sheet & Strip-Cold or Hot Rolled

With Slit, Slit and Edge Rolled, Sheared or Sawed Edges
LENGTH TOLERANCES—FLAT STRAIGHT LENGTHS

In Inches

Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges or Condenser Tube Plates.

TABLE I-SPECIFIC LENGTHS AND SPECIFIC LENGTHS WITH ENDS

Tolerances are all plus. If all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given. For Length Tolerances for Square Sheared and for Sawed Metal, see Table II and Table III, following page.

Lengths	Applicable Only to Full LengthPieces
Specific Lengths, up to 10' inclusive	1/4
over 10' to 20' inclusive	1/2
Specific Lengths with Ends	1

TOLERANCES For Copper Sheet & Strip-Cold or Hot Rolled

With Slit, Slit and Edge Rolled, Sheared or Sawed Edges

SLIT METAL-WIDTH TOLERANCES (in Inches)
For Metal Furnished in Flat Straight Lengths, in Rolls, or Spooled

The following width tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given. Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges or Condenser Tube Plates.

TABLE I-SLIT METAL and SLIT METAL WITH BOLLED EDGES

The change in width resulting from edge rolling of metal previously slit is negligible, and therefore the width tolerances for slit metal and for slit metal with rolled edges are the same.

	Thickness in Inches			
Width in Inches	.004 to .032 incl.	Over .032 to .125 incl.	Over .125 to .188 incl.	Over .188 to .500 incl.
Up to 2 incl	.005 .008 1/64	.010 .013 1/64	.012 .015 1/64	.015 .015 1/32

SQUARE SHEARED METAL - LENGTH AND WIDTH TOLERANCES-In Inches

Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges, Length Tolerances, Width Tolerances; Condenser Tube Plates.

TABLE II-ALL LENGTHS AND WIDTHS UP TO 10 FEET, INCLUSIVE

The following length and width tolerances are plus and minus: if tolerances are desired all plus or all minus, double the values given.

	Thickness in Inches		
Length or Width in Inches	Up to 1/16 incl.	Over 1/16 to 1/8 incl.	Over 1/8
Up to 20 incl	1/32 3/64 1/16	3/64 3/64 1/16	1/16 1/16 1/16

TABLE III - LENGTH AND WIDTH TOLERANCES-In Inches-SAWED METAL

Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges.

	Width Tolerances Plus and Minus** In Inches			
Width in	Length Tolerances All Plus* In Inches	For Le		For Lengths over 10'
Inches		For Thicknesses up to 1 1/2" incl.	For Thicknesses over 1 1/2"	All Thicknesses
Up to 12 wide, incl Over 12 to 120 wide, incl.	1/4 1/4	1/32 1/16	1/16 1/16	1/16 1/16

^{*}These length tolerances are all plus; if all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

^{**}These width tolerances are plus and minus; if tolerances are desired all plus or all minus, double the values given.

TOLERANCES

For Copper Sheet & Strip-Cold or Hot Rolled

STRAIGHTNESS TOLERANCES-In Inches

FLAT PRODUCTS (COLD OR HOT ROLLED)

With Slit, Slit and Edge Rolled, Sheared or Sawed Edges

Applicable to any longitudinal surface or edge of material supplied in nominally flat straight lengths and to any longitudinal edge of material supplied in rolls.

Not applicable to Flat Products with Rolled (not previously slit) or Drawn Edges.

MAXIMUM EDGEWISE CURVATURE (Depth of Arc)
IN ANY 6 FOOT PORTION OF THE TOTAL LENGTH

TABLE I-SLIT METAL AND SLIT METAL WITH ROLLED EDGES

	SLIT METAL			
Width in Inches	As Slit Only		As Slit and Either Straightened or Edge Rolled	
	Shipped in Rolls	Shipped Flat	Shipped Flat, in Rolls or on Bucks	
Over 1/4 to 3/8 incl. Over 3/8 to 1/2 incl. Over 1/2 to 1 incl. Over 1 to 2 incl. Over 2 to 4 incl. Over 4	2 1 1/2 1 5/8 1/2 3/8	1 1/2 1 3/4 5/8 1/2 3/8	1/2 1/2 1/2 1/2 3/8 3/8 3/8	

TABLE II-SQUARE SHEARED METAL-Flat Straight Lengths Not applicable to metal over 10 feet long.

		Width in Inches		
	Thickness in Inches	Up to 10 incl.	Over 10	
	Up to 1/8 incl	1/16 1/8 1/8	1/32 3/64 1/16	

TABLE III—SAWED METAL—Flat Straight Lengths Not applicable to metal over 12 feet long.

Width in I	nches
Up to 3 incl.	Over 3
1/16	3/64





TOLERANCES Copper Sheet and Strip Rolled to Weight

(Cold Rolled)

Including Strip Copper Marked With Ounce Weights

WEIGHT AND THICKNESS TOLERANCES

Weight per Square	Theoretical Thickness	Minimum Thickness in inches	Lot Weight Tolerances Based on Case or Crate Weight normally approximately 500 pound		
Foot Ounces	in Inches	at any point	Minimum	Maximum	
32	.0431	.0405	95%	105%	
28	.0377	.0355	95%	105%	
24	.0323	.0300	95%	105%	
20	.0270	.0245	95%	105%	
18	.0243	.0225	95%	105%	
16*	.0216	.0190	97%	103%	
14*	.0189	.0160	97%	103%	
12	.0162	.0140	95%	105%	
10	.0135	.0120	95%	105%	

The above tolerances are applicable to sheet and strip furnished flat up to 36° wide, inclusive, and up to 120° long inclusive.

Thickness calculated for a unit weight of 0.322 pound per cubic inch.

*14 and 16 ounce strip copper is commonly stamped with the ounce weight.

LENGTH, WIDTH & STRAIGHTNESS TOLERANCES See Pages 22, 23, 24, this section





SEAMLESS COPPER TUBE



Chase Metals Service Centers stock large quantities of round Seamless Copper Tube in sizes from 1/8-inch to 10 inches O.D. in straight lengths. A choice of wall thicknesses and tempers is always available. Larger sizes, up to 14" O.D. are available to us from mill stocks for quick shipment to you.

Standard sizes in soft temper are also stocked in 25 to 100-foot coils.

We can also supply seamless copper tube in square, rectangular, hexagonal and other shapes. Your inquiries are invited.



HIGH PHOSPHORUS COPPER TUBE

COPPER NO. 122

CHEMICAL COMPOSITION*

Copper, 99.9% min.

Phosphorus, 0.02%

High Phosphorus Copper is particularly suited for applications requiring hot working, bright annealing, soldering, brazing or welding operations in which the residual phosphorus prevents the absorption of oxygen by the copper. It is widely used for plumbing, gas and oil lines, refrigeration, condensers, brewery and distillery tubes, and rotating bands.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)	Suitability for Being Joined by:
Rating 20	Soft Soldering Excellent
Type of Chip L	Brazing Excellent
Capacity for Being Cold Worked . Excellent	Oxyacetylene Welding Good
Capacity for Being Hot Formed Excellent	Carbon Arc Welding Good
Hot Forgeability Rating	Gas Shielded Arc Welding Excellent
(Forging Brass = 100) 65	Coated Metal Arc Welding Not Recom.
Hot Working Temperature	Resistance Welding:
1400°-1600°F. or 750°-875°C.	Spot Not Recommended
Annealing Temperature	Seam Not Recommended
700°-1200°F. or 375°-650°C.	ButtGood

MECHANICAL PROPERTIES* (1.0 x 0.049)

	Drawn General Purpose	0.050 mm Anneal
Tensile Strength, p.s.i.	55,000	32,000
Yield Strength, p.s.i.	50,000	10,000
Shear Strength, p.s.i.	29,000	22,000
Elongation, % in 2-in.	8	45
Rockwell Hardness	58(30T); F95, B60	F40

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus —	Liquidus 1981
Density, lbs., per cu. in. @ 68 F.	0.323
Specific gravity	8.94
Coefficient of Thermal Expansion	0.0000098 per °F. from 68 F. to 572 F.
Thermal Conductivity	196 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	12.2 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	85 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.092 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	17,000,000 psi
Modulus of Rigidity	6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	75
A.S.T.M.	B68, Type DHP; B75, Type DHP; B88; B111; B280, Type DHP; B302; B306
A.M.S. Federal	WW-T-00797b (Navy-Ships)

^{*}All Values nominal. Not to be used as specification requirements.

SEAMLESS COPPER TUBE

ROUND-GENERAL PURPOSE TEMPER

In 12 to 15-Foot Mill Lengths (For Data, See Preceding Page)

O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin.Ft. (Approx.)
1/8 3/16 1/4	.032 .032 .062	.036 .061 .142	1 1/4 1 1/4 1 1/4	.072 .065 .049	1.03 .938 .717
$\frac{1/4}{1/4}$.035	.092	1 1/4 1 3/8	.035	.517 1.31
1/4 1/4 5/16 5/16 3/8	.031 .025 .035 .032 .065	.083 .069 .118 .110	1 3/8 1 1/2 1 1/2 1 1/2 1 1/2	.035 .109 .083 .065	.571 1.84 1.43 1.14 .865
3/8 3/8 3/8 3/8 3/8	.049 .042 .040 .035 .030	.195 .170 .163 .145 .126	1 3/4 1 3/4 2 2 2	.095 .065 .109 .095	1.91 1.33 2.51 2.20 1.94
3/8 7/16 1/2 1/2 1/2	.028 .049 .065 .049 .035	.118 .232 .344 .269	2 2 2 1/8 2 1/4 2 1/4	.065 .025 .065 .109	1.53 .601 1.63 2.84 1.73
9/16 5/8 5/8 5/8 5/8	.049 .125 .065 .049	.306 .761 .443 .343	2 1/2 2 1/2 2 1/2 2 1/2 2 1/2 3	.134 .125 .083 .065	3.86 3.61 2.44 1.93 5.69
3/4 3/4 3/4 7/8 7/8	.065 .058 .035 .065 .058	.542 .488 .304 .640	3 3 3 3 1/2 4	.134 .083 .065 .134	4.67 2.95 2.32 5.49 6.71
1 1 1 1 1 1/8	.083 .065 .049 .035	.926 .739 .567 .411	5 6 8 10	.134 .165 .203 .238	7.94 11.7 19.3 28.3

ROUND-HARD DRAWN TEMPER

In 20-foot Exact Lengths

			Weight Lbs. per 20' Length (Approx.)				Weight Lbs. per 20' Length (Approx.)
1/4	.032	.085	1.70	1	.083	.927	18.5
1/4	.025	.069	1.38	1	.065	. 740	14.8
3/8	.032	. 134	2.68	1	.035	.411	8.22
3/8	.028	.118	2.36	1 1/4	.065	.938	18.8
3/8	.020	.087	1.74	1 1/2	.065	1.14	22.8
1/2	.032	. 182	3.64				





SEAMLESS COPPER TUBE

HIGH PHOSPHORUS COPPER-COPPER NO. 122

(For Data, See Page 27, this Section)

ROUND-SOFT TEMPER

In 12-foot Random Lengths

	W-11	Wai -b+		Wall	Weight
	Wall	Weight	1	Wall	_
	Thickness	Lbs. per		Thickness	Lbs. per
O.D.	in	Lin. Ft.	O.D.	in	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
1/8	.032	.036	3/8	.032	. 134
3/16	.035	.065	3/8	.028	.118
3/16	.032	.060	7/16	.035	. 172
1/4	.035	.091	1/2	.035	. 198
1/4	.032	.084	1/2	.032	. 182
5/16	.035	.118	5/8	.035	.251
5/16	.032	. 109	3/4	.035	.305
3/8	.042	.170	1	.035	.411
3/8	.035	.145	1		
		In 25-fo	ot Coila		
		111 23-10			
3/16	.035	.065	1/2	.049	.269
1/4	.035	.092	1/2	.035	. 198
5/16	.035	.118	5/8	.042	.298
3/8	.042	.170	5/8	.035	.251
3/8	.035	.145	3/4	.042	.362
7/16	032	158	3/4	035	305

In 50-foot Coils

O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	Weight Lbs. per Coil (Approx.)	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	Weight Lbs. per Coil (Approx.)
1/8 1/8 3/16 3/16 1/4	.035 .032 .035 .032 .035	.038 .036 .065 .061 .092	1.90 1.80 3.25 3.05 4.60	3/8 3/8 3/8 3/8 3/8	.049 .042 .035 .032	.195 .170 .145 .134 .118	9.75 8.50 7.25 6.70 5.90
1/4 5/16 5/16 5/16 3/8	.032 .049 .035 .032	.085 .157 .118 .109 .245	4.25 7.85 5.90 5.45 12.3	1/2 1/2 5/8 5/8 5/8 3/4	.035 .032 .035 .032	.198 .182 .251 .231 .280	9.90 9.10 12.6 11.6 14.0
			In 75-foot	Coils			
3/16	.025	.050	3.75	1/4	.025	.069	5.18
			In 100-foo	t Coils			
1/2	.032	.182	18.2	5/8	.032	.231	23.1





CHASE COPPER WATER TUBE



Years of pioneering the use of copper water tube-experienced engineerslatest production techniques and equipment-have made Chase the "pacesetter" and one of the leaders in the copper tube industry. Millions of feet of Chase Copper Tube are in use today. It is specified by architects, engineers and contractors for such applications as water lines, heating and cooling lines,

and industrial piping.

Type K is recommended for water, gas, steam and hot water systems, underground service, and for industrial piping and other plumbing where service conditions are relatively severe.

Type L is used in the same general applications, but where relatively less severe service conditions exist. It is especially recommended for radiant heating and for general plumbing purposes.

Type M offers the durability of copper in a lighter wall tube for use where service conditions permit this economy. It is recommended for exposed lines in forced hot water heating systems. Larger sizes are widely used in process piping in many industries.

DWV Drainage Tube is recommended for above ground use in soil, waste and vent lines. A new, lower cost tube, it combines well engineered design with significant economy and the many fine qualities of copper. It is easier to handle because of its light weight and can be installed faster, with far less effort than other types of piping.



COPPER WATER TUBE

(For Stock Listings, See Following Pages.)

CHEMICAL COMPOSITION*

Copper. 99.7% min.

Phosphorus, 0.025%

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass =	100) Suitability for Being Joined by:
Rating	20 Soft Soldering Excellent
Type of Chip	L Brazing Excellent
Capacity for Being Cold Worked . Exc	ellent Oxyacetylene Welding Good
Capacity for Being Hot Formed .Exc	ellent Carbon Arc Welding Good
Hot Forgeability Rating	Gas Shielded Arc Welding
(Forging Brass = 100)	Coated Metal Arc Welding Not Recom.
Hot Working Temperature	Resistance Welding:
1400°-16	500°F. Spot
Annealing Temperature	Seam
	Butt

MECHANICAL PROPERTIES* (5/8" x 0.040-1/2" Type L)

	Hard Drawn (50%)	Light Drawn (15%) for Bending	Soft 0.060 mm Anneal
Tensile Strength, p.s.i.	55,000	41,000	31,000
Yield Strength, p.s.i.	50,000	39,000	8,000
Shear Strength, p.s.i.	29,000	26,000	22,000
Elongation, % in 2-in.	6	32	50
Rockwell Hardness	F95; B60	F84	F84

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus — Density, lbs., per cu. in. @ 68 F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) Modulus of Rigidity

Liquidus 1981

0.323

0.0000098 per °F. from 68 F. to 572 F. 196 Btu,/sq. ft./ft./hr./°F. @ 68 F.

85 % IACS @ 68 F.

17,000,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M. A.M.S. Federal Military $\frac{75}{B88}$ (Except minimum copper content)

WW-T-799a, Amend. 1 (Except minimum copper content)

^{*}All Values nominal. Not to be used as specification requirements.



CHASE COPPER WATER TUBE

TYPE "K" - SOFT TEMPER

Nominal Size Inches	O.D. Inches	Wall Thickness in Inches	Weight Lbs.per Lin.Ft. (Approx.)	Nominal Size Inches	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)
			In 30-fo	ot Coils			
$\frac{1/2}{3/4}$.625 .875	.049	.344	1	1.125	.065	.839
			In 40-fo	ot Coils			
2	2.125	.083	2.06			• • •	• • •
			In 45-fo	ot Coils			
3/4	.875	.065	.641	1 1/2	1.625	.072	1.36
1	1.125	.065	.839	2	2.125	.083	2.06
1 1/4	1.375	.065	1.04				
			In 60-fc	oot Coils			
1/4	.375	.035	.145	1	1.125	.065	.839
3/8	.500	.049	.269	1 1/4	1.375	.065	1.04
1/2	. 625	.049	.344	1 1/2	1.625	.072	1.36
5/8	.750	.049	.418	2	2.125	.083	2.06
3/4*	.875	.065	.641 Also carried w	ith canned er	nds		
					ids.		
				oot Coils			222
3/4	.875	.065	.641	1	1.125	.065	.839
			In 100-f	oot Coils			
1/4	.375	.035	.145	3/4	.875	.065	.641
3/8	. 500	.049	.269	1	1.125	.065	.839
1/2	. 625	.049	. 344	1 1/4	1.375	.065	1.04
5/8	. 750	.049	.418	1 1/2	1.625	.072	1.36
			In 20-foot Str	aight Length	S		
3/8	.500	.049	.269	1 1/2	1.625	.072	1.36
1/2	. 625	.049	. 344	2	2.125	.083	2.06
5/8	. 750	.049	.418	2 1/2	2.625	.095	2.93
3/4	.875	.065	.641	3 4	3.125 4.125	.109 .134	4.00 6.51
$\frac{1}{1}$ $\frac{1}{4}$	1.125 1.375	.065	.839 1.04	*	7.123	.104	0.01
1 1/4	1.010	.000		•			
			TYPE "K"-	HARD DRAW	N		
			In 20-foot St	raight Length	ns		
1/4*	.375	.035	.145	2*	2.125	.083	2.06
3/8*	.500	.049	.269	2 1/2	2.625	.095	2.93
1/2*	. 625	.049	. 344	3	3.125	.109	4.00
5/8	. 750	.049	.418	3 1/2	3.625	.120	5.12
3/4*	.875	.065	.641	4	4.125	.134	6.51
1*	1.125	.065	.839	5	5.125	.160	9.67
1 1/4*	1.375	.065	1.04	6	6.125	. 192	13.9
1 1/2*	1.625	.072	1.36	8	8.125	.271	25.9
		*	Also carried	with capped e	nds.		

*Also carried with capped ends.



CHASE COPPER WATER TUBE

TYPE "L" - SOFT TEMPER

		Wall	Waight				Well	Waight
Nominal Size Inches	O.D.	Wall Thickness in Inches	Weight Lbs. per Lin.Ft. (Approx.)		Nominal Size Inches	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)
Inches	menes	menes	(rippi ox.)		menes	menes	menes	(Tippion.)
			In 30-	foot	Coils			
1/4	.375	.030	.126		1/2	.625	.040	.285
3/8	. 500	.035	.198	1	3/4	.875	.045	.455
			In 40-	foot	Coils			
2	2.125	.070	1.75	ı	• •	• • •	• • •	• • •
			In 45-	foot	Coils			
2 /4	.875	.045	.455	1				
3/4	.815	.045	.455	'	• •	•••	• • •	•••
			In 60-	foot	Coils			
1/4*	.375	.030	.126	1	3/4*	.875	.045	.455
3/8*	.500	.035	. 198		1*	1.125	.050	.655
1/2*	.625	.040	.285	1	1 1/4*	1.375	.055	.884
5/8	.750	.042	.362 lso carried	with	1 1/2	1.625	.060	1.14
		11	iso carrica	W 1 611	capped c	ilus		
			In 100-	foot	Coils			
1/2	.375	.030	.126	1	3/4	.875	.045	.455
3/8	. 500	.035	. 198		1	1.125	.050	.655
1/2	.625	.040	.285		$1 \ 1/4$	1.375	.055	.884
5/8	.750	.042	.362	1				
			In 150-	foot	Coils			
3/8	.500	.035	.198	1	1	1.125	.050	. 655
			In 200-	-foot	Coils			
1/2	. 625	.040	.285	1	•••	• • •	•••	•••
		Ir	20-foot Str	aigh	nt Lengths			
1/4	.375	.030	.126		1	1.125	.050	.655
3/8	.500	.035	.198		1 1/4	1.375	.055	.884
1/2	. 625	.040	.285		1 1/2	1.625	.060	1.14
5/8	.750	.042	.362		2	2.125	.070	1.75
3/4	.875	.045	.455	1	2 1/2	2.625	.080	2.48



CHASE COPPER WATER TUBE

TYPE "L" - HARD DRAWN

In 20-foot Straight Lengths

Nominal Size Inches	O.D.	Wall Thickness in Inches	Weight Lbs. per Lin.Ft. (Approx.)		minal Size Iches	O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/4*	. 375	.030	. 126	2	*	2.125	.070	1.75
3/8*	.500	.035	.198	2	1/2*	2.625	.080	2.48
1/2*	. 625	.040	.285	3	*	3.125	.090	3.33
5/8*	. 750	.042	.362	3	1/2*	3.625	. 100	4.29
3/4*	.875	.045	. 455	4	*	4.125	.110	5.38
1 *	1.125	.050	. 655	5	*	5.125	. 125	7.61
1 1/4*	1.375	.055	.884	6	*	6.125	.140	10.2
1 1/2*	1.625	.060	1.14	8		8.125	.200	19.3

^{*} Also carried with capped ends

Type	"L" -	- BENDI	NG TEMPER	
In 20	foot	Straight	Lengths	

	11	1 20-1001	oti aigiit	Deliguis			
3/8 .500 1/2 .625		.198 .285	1	3/4	.875 1.125	.045	.455 .655

TYPE "M" - HARD DRAWN

In 20-foot Straight Lengths

			III 20-100t 5ti 8	tight Dengthb			
1/4*	.375	.025	.106	2 *	2.125	.058	1.46
3/8*	. 500	.025	.145	2 1/2	2.625	.065	2.03
1/2*	. 625	.028	.204	3	3.125	.072	2.68
5/8*	. 750	.030	.263	3 1/2	3.625	.083	3.58
3/4*	.875	.032	.328	4	4.125	.095	4.66
1 *	1.125	.035	.465	5	5.125	.109	6.66
1 1/4*	1.375	.042	. 682	6	6.125	. 122	8.92
1 1/2*	1.625	.049	.940	8	8.125	.170	16.5

^{*} Also carried with capped ends

CHASE COPPER DRAINAGE TUBE-DWV

HARD DRAWN

In 20-foot Straight Lengths

1 1/4	1.375	.040	. 650	4	4.125	.058	2.87
1 1/2	1.625	.042	.650 .810 1.07	5	5.125	.072	4.43
2	2.125	.042	1.07	6	6.125	.083	6.10
2	2 125	045	1 69				



COPPER REFRIGERATION TUBE

COPPER NO. 122

CHEMICAL COMPOSITION*

Copper, 99,90% min.

Phosphorus, 0.025%

Made of commercially pure copper, Chase Extra Soft Copper Tube for the refrigeration and air conditioning industry is manufactured by closely controlled mill processes. Close supervision, modern equipment, and careful inspection assures uniform temper, even expansion and contraction, close tolerances, accuracy in size, clean and oxide-free inside and outside surfaces. Every length of tube has been electronically tested by eddy current devices to detect and reject any defective pieces.

FABRICATION PROPERTIES*

	Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing Excellent Oxyacetylene Welding Good Carbon Arc Welding Excellent Coated Metal Arc Welding Excellent Coated Metal Arc Welding Not Recom. Resistance Welding: Spot Not Recommended Seam Not Recommended Butt Good
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MECHANICAL PROPERTIES*

	5/8" x 0.035, 0.060 mm Anneal
Tensile Strength, p.s.i.	31,000
Yield Strength, p.s.i.	80,000
Shear Strength, p.s.i.	22,000
Elongation, % in 2-in.	50
Rockwell Hardness	F30

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus	Liquidus 1981
Density, lbs., per cu. in. @68 F.	0.323
Specific gravity	8.94
Coefficient of Thermal Expansion	0.0000098 per °F. from 68 F. to 572 F.
Thermal Conductivity	196 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	12.2 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	85 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.092 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	17,000,000 psi
Modulus of Rigidity	6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. A.S.T.M.	75 B280, Type DHP, B68, Type DHP, B75, Type DHP
A.M.S.	
Federal	WW-T-799a, Amend. 1
Military	

^{*}All Values nominal. Not to be used as specification requirements.



COPPER REFRIGERATION TUBE

IN COILS-COPPER NO. 122

ROUND-DEHYDRATED AND SEALED-EXTRA SOFT

DEOXIDIZED-BRIGHT ANNEALED

Individually Packaged in 50-foot Coils. 3/8", 1/2" and 5/8" O.D. also Individually Packaged in 100-foot Coils.



Chase Extra Soft Copper Refrigeration Tube is made from commercially pure copper. Because of the new uniformly soft anneal given refrigeration tube, it can be easily bent and flared by any of the usual methods. During the automatically controlled bright anneal no air touches it, ensuring a clean, bright oxide-free tube. Sizes 1/8" through 3/4" O.D. x .035" wall are sealed with crimped ends to keep out moisture, dirt and air. Sizes 3/4" O.D. x .042" wall and larger are sealed with plastic plugs.

Chase Extra Soft Copper Refrigeration Tube in sizes 1/8" through 3/4" O.D. x .035" wall is packed in double layer coils. Sizes 3/4" O.D. x .042" wall and larger are in pancake type coils. The number of individually wrapped coils per master carton depends upon the diameter of the tube.

	Weight			1			Weight	
	Wall	Lbs. per	Lbs.per			Wall	Lbs. per	Lbs.per
O.D.	Thickness	Lin. Ft.	50 ft. Coil		O.D.	Thickness	Lin. Ft.	50 ft. Coil
Inches	Inches	(Approx.)	(Approx.)		Inches	Inches	(Approx.)	(Approx.)
1/8	.030	.0347	1.74		5/8	.035	.251	12.55
3/16	.030	.0575	2.88		3/4	.035	.305	15.25
1/4	.030	.0804	4.02		3/4	.042	. 362	18.10
5/16	.032	.109	5.45		7/8	.045	.455	2 2. 75
3/8	.032	.134	6.70	1	1/8	.050	.655	32.75
1/2	.032	.182	9.10	1	3/8	.055	.884	44.20

All sizes of Chase Copper Refrigeration Tube can be furnished electrotinned outside only.



ACR COPPER TUBE

COPPER NO 122

CHEMICAL COMPOSITION*

Copper, 99,90% min.

Phosphorus, 0.025%

Chase ACR hard temper Copper Tube is specially engineered for air conditioning and refrigeration work. O.D. and I.D. dimensions are maintained to close tolerances. Ends are free from burrs. Each length is electronically tested to locate and reject mechanical defects. It is specially cleaned either by vapor degreasing or by washing with a hot water alkaline detergent, rinsing with hot water, and purging with dry air. Ends are sealed with plastic plugs. All Chase ACR Copper Tube is shipped in boxes.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering
700°-1200°F, or 375°-650°C.	Dull

MECHANICAL PROPERTIES*

	1.0 x 0.049-Drawn General Purpose	Annealed 0.050 mm
Tensile Strength, p.s.i.	55,000	32,000
Yield Strength, p.s.i.	50,000	10,000
Shear Strength, p.s.i.	29,000	22,000
Elongation, % in 2-in.	8	45
Rockwell Hardness	(30T), F95, B-60	F40

PHYSICAL PROPERTIES*

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	75
A.S.T.M.	B75, Type DHP
A.M.S.	
Federal	WW-T-799a, Amend. 1
Military	

^{*}All Values nominal. Not to be used as specification requirements.

CHASE COPPER AIR CONDITIONING AND REFRIGERATION TUBE (ACR)

COPPER NO. 122

HARD TYPE L COPPER WATER TUBE-SPECIALLY CLEANED - CAPPED ENDS
In 20-foot Straight Lengths

O.D. Inches	Wall Thickness in Inches	Lbs. per Lin. Ft. (Approx.)	20' Length	O.D. Inches	Wall Thickness in Inches		Weight Lbs. per 20' Length (Approx.)
3/8 1/2 5/8 3/4 7/8	.030 .035 .040 .042	.126 .198 .285 .362 .455	2.52 3.96 5.70 7.24 9.10	2 1/8 2 5/8 3 1/8 3 5/8 4 1/8	.070 .080 .090 .100	1.75 2.48 3.33 4.29 5.38	35.0 49.6 66.6 85.8 107.6
1 1/8 1 3/8	.050	.655 .884	13.1 17.7	5 1/8 6 1/8	.125 .140	7.61 10.2	152.2 204.0

CHASE COPPER EVAPORATIVE COOLER SERVICE TUBE

COPPER NO. 122

SOFT TEMPER

In 50-foot Coils

	Wall		Weight	1	Wall		Weight
	Thickness	Lbs. per	Lbs. per		Thickness	Lbs. per	Lbs. per
O.D.	in	Lin. Ft.	Coil	O.D.	in	Lin. Ft.	Coil
Inches	Inches	(Approx.)	(Approx.)	Inches	Inches	(Approx.)	(Approx.)
1/4	.025	.069	3.45	3/8	.028	.118	5.90
1/4	.020	.056	2.80	3/8	.025	.107	5.35
5/16	.025	.088	4.40				

CHASE COPPER OIL BURNER TUBE

COPPER NO. 122

SOFT TEMPER

O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	Weight Lbs. per Coil (Approx.)		O.D. Inches	Wall Thickness in Inches	Weight Lbs. per Lin. Ft. (Approx.)	Weight Lbs. per Coil (Approx.
			In 25-	foot	Coils			
1/4	.049	.120	3.00	1	5/16	.049	.157	3.93
			In 50-	foot	Coils			
1/4 5/16	.049	.120 .157	6.00 7.85	1	3/8	.049	.195	9.75
			In 60-	-foot	Coils			
1/4 5/16	.049	.120 .157	7.20 9.42	1	3/8	.049	.195	11.7



SQUARE COPPER TUBE BUS CONDUCTOR

COPPER NO. 120

HINVENTIL ATED

In 12-foot Mill Lengths

	Wall	Weight	1	Wall	Weight
	Thickness	Lbs. per		Thickness	Lbs. per
O. D.	in	Lin. Ft.	O. D.	in	Lin. Ft.
Inches	Inches	(Approx.)	Inches	Inches	(Approx.)
01/001/9	250	8.31	3 x 3	. 250	10.24

CHASE COPPER AUTOMOTIVE TUBE

COPPER NO. 122

ROUND-SOFT TEMPER

Individually Packaged in 25-foot Coils-25 Packages per Carton



Chase Copper Automotive Tube is made from commercially pure, deoxidized copper. This tube is drawn to size by improved machinery which insures accuracy of diameter and wall thickness and a smooth surface free from scratches or other blemishes. Every length of tube is pressure tested and given a surface inspection. It then passes through a modern automatic annealing furnace to obtain just the right temper for bending.

O.D. Inches	Wall Thickness Inches	Weight Lbs. per Coil (Approx.)	O.D. Inches	Wall Thickness Inches	Weight Lbs. per Coil (Approx.)
1/8	.030	.867	7/16	.032	3.95
3/16	.030	1.44	1/2	.032	4.55
1/4	.030	2.01	5/8	.035	6.28
5/16	.032	2.725	3/4	.035	7.62
3 / 2	032	3.35			



LOW PHOSPHORUS COPPER TUBE AND PIPE

COPPER NO. 120

CHEMICAL COMPOSITION*

Copper, 99.9% min.

Phosphorus, 0.007%

Low Phosphorus Copper Tube and Pipe are high conductivity materials that are adapted to electrical use, bus conductors, applications involving welding or brazing, and, with threaded or brazed fittings, for straight long runs of water or other liquid lines.

FABRICATION PROPERTIES*

Type of Chip L Capacity for Being Cold Worked Excellent Capacity for Being Hot Formed Excellent Hot Forgeability Rating (Forging Brass = 100)	oft Soldering . Excellent Grazing . Excellent Oxyacetylene Welding
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MECHANICAL PROPERTIES* (1.0 x 0.049)

Hard (50%)
Tensile Strength, p.s.i. 55,000
Yield Strength, p.s.i. 50,000
Shear Strength, p.s.i. 29,000
Elongation, % in 2-in. 8
Rockwell Hardness B60, 30T58, F95

PHYSICAL PROPERTIES*

1981 Melting Point, °F. Solidus Liquidus 0.323 Density, lbs., per cu. in. @ 68 F. Specific gravity 8.94 0.0000098 per °F. from 68 F. to 572 F. Coefficient of Thermal Expansion 226 Btu./sq. ft./ft./hr./°F. @ 68 F. Thermal Conductivity 10.3 Ohms (circ. mil./ft.) @ 68 F. Electrical Resistivity (Annealed) 101 % IACS @ 68 F. Electrical Conductivity (Annealed) .092 Btu./lb./°F. @ 68 F. Thermal Capacity (Specific Heat) Modulus of Elasticity (Tension) 17,000,000 psi Modulus of Rigidity 6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E. 75
A.S.T.M. B188, Type DLP; B75, Type DLP; B280, Type DLP
A.M.S. Federal WW-T-797
Military MIL-T-873a (Ships), Amend. #2

^{*}All Values nominal. Not to be used as specification requirements.





COPPER PIPE

COPPER NO. 120

REGULAR

In 12-foot Lengths

			In 12-foo	t Lengths			
Standard Pipe Size Inches	O.D. Inches	Wall Thickness Inches	Weight Lbs.per Lin.Ft. (Approx.)	Standard Pipe Size Inches	O.D. Inches	Wall Thickness Inches	Weight Lbs.per Lin.Ft. (Approx.)
1/8 1/4 3/8 1/2 3/4	.405 .540 .675 .840 1.050	.062 .082 .090 .107	.259 .457 .641 .955	2 2 1/2 3 3 1/2 4	2.375 2.875 3.500 4.000 4.500	.156 .187 .219 .250	4.22 6.12 8.75 11.4 12.9
$\begin{array}{ccc} 1 & & \\ 1 & 1/4 & \\ 1 & 1/2 & \end{array}$	1.315 1.660 1.900	.126 .146 .150	1.82 2.69 3.20	5 6	5.562 6.625	.250 .250	16.2 19.4
			In 20-foo	t Lengths			
1/4 3/8 1/2 3/4	.540 .675 .840 1.050 1.315	.082 .090 .107 .114 .126	.457 .641 .955 1.30 1.82	2 2 1/2 3 3 1/2 4	2.375 2.875 3.500 4.000 4.500	.156 .187 .219 .250	4.22 6.12 8.75 11.4 12.9
1 1/4 1 1/2	1.660 1.900	.146 .150	2.69 3.20	5 6	5.562 6.625	.250 .250	16.2 19.4
			EXTRA	A STRONG			
			In 12-fo	ot Lengths			
1/8 1/4 3/8 1/2 3/4	.405 .540 .675 .840	.100 .123 .127 .149 .157	.371 .625 .847 1.25 1.71	1 1/2 2 2 1/2 3 4	1.900 2.375 2.875 3.500 4.500	.203 .221 .280 .304 .341	4.19 5.80 8.85 11.8 17.3
1 1 1/4	1.315 1.660	.182 .194	2.51 3.46	6	6.625	.437	32.9
			In 20-fo	ot Lengths			
$1/2 \\ 3/4$.840 1.050 1.315	.149 .157 .182	1.25 1.71 2.51	1 1/4 1 1/2 2	1.660 1.900 2.375	.194 .203 .221	3.46 4.19 5.80
	CC	OPPER	THR	EADLES	S PI	PE	
				NO. 122			
				DRAWN ot Lengths			
1/4 3/8 1/2 3/4	.540 .675 .840 1.050 1.315	.065 .065 .065 .065	. 376 . 483 . 613 . 780 . 989	2 1/2 3 3 1/2 4	2.375 2.875 3.500 4.000 4.500	.065 .065 .083 .095 .107	1.83 2.22 3.45 4.52 5.72
$\begin{array}{ccc} 1 & 1/4 \\ 1 & 1/2 \end{array}$	1.660 1.900	.065	1.26 1.45	5 6	5.562 6.625	.132 .158	8.73 12.40

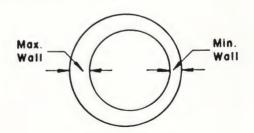
Sizes other than listed can be furnished from Mill stocks.

COPPER 41.



TERMS RELATING TO MEASUREMENTS OF ROUND TUBES

CONCENTRICITY, Concentricity implies coincidence of the centers of the OD and ID. However, since a relative displacement (eccentricity) of the centers is difficult to measure directly, while the resulting variation in Wall Thickness is relatively easy to measure, Concentricity and Eccentricity are preferably expressed in terms of the latter. Thus as a practical matter. Eccentricity is here defined and conventionally measured as the difference between the Maximum Wall and Minimum Wall determined at any one cross-section. Measurement of the individual Wall Thicknesses can best be made with a micrometer caliper.



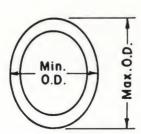
(Exaggerated for Illustration)

Eccentricity or Departure from
True Concentricity = Max. Wall - Min. Wall

$$\label{eq:percent} \mbox{Percent Eccentricity} = \frac{\mbox{Max. Wall - Min. Wall}}{\mbox{Average Wall}} \; \mbox{x 100}$$

Studies of commercial tube show that the Eccentricity increases with increase of both Nominal Wall and Nominal OD.

ROUNDNESS. Roundness implies a truly circular periphery of the inside or the outside surface. Since experience shows the degree of departure from roundness is the same on the OD and the ID, but is more readily measured on the former, it is customary to determine



(Exaggerated for Illustration)

Departure from Roundness (i.e., Out-of-Roundness) = Max. OD - Min. O.D.

$$Percent Out-of-Roundness = \frac{Max. OD - Min. OD}{Average OD} \times 100$$

departure from roundness of the OD, even when the tube is specified as to ID only. Out-of-roundness is determined as the total difference found at any one cross-section, between the individual maximum and minimum Outside Diameters which usually occur at or about 90° to each other. Roundness is not expressed as plus and minus.

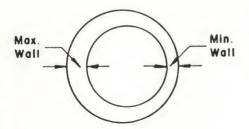
Measurements can best be made by means of a micrometer caliper. Roundness is not to be confused with Concentricity as there is no connection whatever between the two. Roundness tolerances, given on COPPER Page 47, are applicable to drawn tube only.

WALL THICKNESS-AVERAGE. For all practical purposes, the Average Wall Thickness is the average at any one cross-section, of the maximum and minimum wall thickness, usually found at or very close to 180° apart. The individual measurements are most conveniently made by means of a micrometer caliper. If the tube were perfectly concentric, the maximum, minimum and average wall thicknesses would of course all be the same.



TERMS RELATING TO MEASUREMENTS OF ROUND TUBES

(Continued)



(Exaggerated for Illustration)

Average Wall = $\frac{\text{Max. Wall + Min. Wall}}{2}$

Departure of Actual Average Wall from that specified = Average Wall - Spec. Wall (If Average Wall is greater than Spec. Wall)

or, alternately = Spec. Wall
- Average Wall
(If Average Wall is less than
Spec. Wall)

Studies of commercial tubes show the variation of Average Wall Thickness from the nominal is dependent only on the diameter of the tube, and practically speaking, independent of the Wall Thickness itself; i.e., the Average Wall Thickness tolerance should be the same for a tube 1'' x 0.100'' as for a tube 1'' x 0.020'', whereas the Average Wall Thickness tolerance for any 2'' diameter tube must be greater than for any 1'' tube.

Inasmuch as tube users seldom specify a tolerance on Average Wall, no schedule is established

TOLERANCES FOR SEAMLESS COPPER TUBES

ROUND SEAMLESS TUBES
(Except Condenser Tubes, Copper Water Tube and Pipe)

GAUGE OR WALL THICKNESS TOLERANCES

Maximum deviation at any point—The following tolerances are plus and minus; if tolerances all plus or all minus are desired, double the values given.

TABLE I

Wall Thickness	Outside Diameter in Inches						
	1/32	Over 1/8	Over 5/8	Over 1	Over 2	Over 4	Over 7
In Inches	to	to	to	to	to	to	to
	1/8 incl.	5/8 incl.	1 incl.	2 incl.	4 incl.	7 incl.	10 incl.
Incl380 and over				5%	5%	6%	6%
Incl284 to .380			.011	.012	.014	.016	.018
Incl220 to .284			.009	.010	.012	.014	.016
Incl165 to .220		.007	.0075	.008	.010	.012	.014
Incl120 to .165		.005	.006	.006	.008	.010	.012
Incl083 to .120		.004	.005	.005	.007	.009	.011
Incl058 to .083		.0035	.004	.004	.006	.008	.010
Incl035 to .058	.003	.003	.0035	.0035	.005	.007	
Incl025 to .035	.003	.0025	.0025	.003	.004		
Incl018 to .025	.003	.002	.002	.0025			
Under .018	.002	.001	.0015	.002			

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.

Continued

TUBE & PIPE

DATA

COPPER 43.

TOLERANCES FOR SEAMLESS COPPER TUBE

ROUND SEAMLESS TUBES

(Except Condenser Tubes and Copper Water Tube and Pipe)

TABLE II-MEAN DIAMETER* TOLERANCES All tolerances plus and minus

Specified Diameter	Tolerance	Tolerai Inch	
in Inches	Applies to	Non- Refr Refractory tor Alloys Allo	
Up to 1/8 incl	Inside Dia Outside Dia Inside or Outside Inside or Outside Inside or Outside	.002 .002 .002 .002 .0025	.003 .0025 .0025 .003
Over 2 to 3 incl	Inside or Outside	.004 .005 .006 .007 .008	.005 .006 .008 .009 .010

^{*} The mean diameter of a tube is the average of the maximum and minimum outside diameters, or of the maximum and minimum inside diameters, as determined at any one cross-section of the tube.

Tolerances on a given tube may be specified with respect to any two, but not all three of the following:

- a. Outside dimension
- b. Inside dimension
- c. Wall thickness

When tube is ordered to either O.D. or I.D., together with wall thickness, the tolerances given in Table I of Page 43, this section, apply.

CONCENTRICITY (Eccentricity) TOLERANCES

When tube is ordered by O.D. and I.D., the wall thickness is controlled by the concentricity (eccentricity) tolerances.

Note: For Redraw Tube, double the mean diameter tolerances given in Table II.





TOLERANCES FOR COPPER

CONDENSER AND OTHER HEAT EXCHANGER TUBES

Dimension and Weight Tolerances

DIAMETER (Applicable to Straight Lengths only)

Diameter in Inches	Outside Diameter Tolerances in Inches (Plus and Minus)
III Melles	Copper
Up to 0.500 incl. Over 0.500 to 0.740 incl. Over 0.740 to 1.000 incl. Over 1.000 to 1.250 incl. Over 1.250 to 1.500 incl.	0.002 0.0025 0.003 0.0035 0.004

LENGTH (Applicable to straight lengths only)

The length shall be not less than that specified, when measured at a temperature of 20° C. (68°F.), but may be more than that specified by the amounts in the following table:

Specific Length	Tolerances
in Feet	in Inches
Up to 15 incl. Over 15 to 20 incl. Over 20 to 30 incl. Over 30 to 60 incl. Over 60 to 100 incl.	3/32 1/8 5/32 1/4 3/8

SQUARENESS OF CUT-See Page 47, this Section.

WALL THICKNESS

All tolerances plus, the upper limit being controlled by the weight tolerances.

WEIGHT

Any lot of 600 tubes or any shipment of more than 600 tubes may exceed the theoretical weight by not more than 5%. One cubic inch of the alloy covered by these specifications shall be assumed to weight 0.323 lbs. per Cu. In.

TOLERANCES FOR SEAMLESS COPPER TUBE

ROUND SEAMLESS TUBES

Not Applicable to Condenser and Other Heat Exchanger Tubes

TABLE I-LENGTH TOLERANCES-STRAIGHT LENGTHS-In Inches

Tolerances all plus; if all minus tolerances are desired, use the same values; if tolerances are desired plus and minus, halve the values given.

	Applicable o	nly to Full Length	Pieces
Length	For Outside Diameters up to 1" incl.	For Outside Diameters over 1" to 4" incl.	For Outside Diameters over 4''
Specific lengths up to 6" incl over 6" to 2" incl over 2" to 6" incl over 6' to 14' incl over 14' Specific lengths with ends	1/32 1/16 3/32 1/4 1/2	1/16 3/32 1/8 1/4 1/2 1	1/8 1/4 1/4 1/2

TABLE II-SCHEDULE OF SPECIFIC LENGTHS WITH ENDS

Outside	Nominal	Minimum Length* of Shortest Piece (In % of Nominal Length)	Max. Permissible
Diameter	Length		Weight of Ends
(In Inches)	(In Feet)		(In % of Lot Weight)
Up to 1 incl Over 1 to 2 incl Over 2 to 3 incl Over 3 to 4 incl	6 to 20 incl.	70	20
	6 to 20 incl.	60	25
	6 to 20 incl.	55	30
	6 to 20 incl.	50	40

^{*}Expressed to the nearest 1/2 foot.

TABLE III-LENGTH TOLERANCES FOR COILS-SPECIFIC LENGTHS-All Plus-In Inches

Outside Diameter	For Nominal Lengths (In Feet)			
(In Inches)	Up to 50 incl.	Over 50 to 100		
Up to 2 incl	12	24		

TABLE IV-LENGTH TOLERANCES FOR COILS-MILL LENGTHS (In percent of nominal length) All Plus

Outside	Applicable only to	Full Length Pieces
Diameter (In Inches)	Up to 100' incl.	Over 100' to 2000' incl.
Up to 1 incl. Over 1 to 2 incl.	5%* or 2', whichever value is greater 5%* or 2', whichever value is greater	10%* No tolerances established

^{*}Expressed to the nearest foot.



TOLERANCES FOR SEAMLESS COPPER TUBE

ROUND SEAMLESS TUBES

Not Applicable to Condenser and Other Heat Exchanger Tubes

TABLE V-COIL SCHEDULE OF MILL LENGTHS WITH ENDS

Outside	Nominal Length (In Feet)	Shortest	Max. Permissible
Diameter		Permissible	Weight of Ends
(In Inches)		Length	(In % of lot weight)
Up to 1 incl. Over 1 to 2 incl. Up to 1 incl.	Up to 100 incl. Up to 100 incl. Over 100 to 2000 incl.	70%* of nominal length 60%* of nominal length 50 feet	10% 20% 50%**

*Expressed to the nearest foot.

Over .10

**Short pieces may be included as follows: Up to 10% of lot weight between 50 feet and one-quarter of full length; and up to 40% between one-quarter and full length.

SQUARNESS OF CUT

(Not Applicable to Extruded Tube, Redraw Tube or any tube furnished in coils.) The angle of cut of the end of the tube may depart from square by not more than .010" for tubes up to and including 5/8" O.D.; for tubes over 5/8" O.D., by not more than .016" per inch of diameter.

STRAIGHTNESS TOLERANCES

For tube in any drawn temper from 1/4" to 3 1/2" outside diameter, but not copper water tube, pipe, redraw tube, extruded tube or any annealed tube.

Length, Feet	Maximum Curvature (Depth of arc), Inches
Over 3 to 6, incl.	3/16
Over 6 to 8, incl.	5/16
Over 8 to 10, incl.	1/2

For lengths greater than 10 feet the maximum curvature shall not exceed 1/2" in any 10 foot portion of the total length.

ROUNDNESS* TOLERANCES

For tube and pipe in any drawn temper in straight lengths. Not applicable to as Extruded Tube, Redraw Tube, Annealed Tube or any tube furnished in coils, or Drawn Tube whose wall thickness is under .016".

Compliance with the Roundess Tolerance shall be determined by taking measurements on the outside diameter only. irrespective of the manner in which the tube dimensions are specified; whether outside diameter and wall thickness, outside diameter and inside diameter, or inside diameter and wall thickness.

T/D, Ratio of Roundness Tolerances*

Nominal Wall Thickness Expressed in Percent of Nominal Outside Diameter
Diameter (Expressed to the nearest .001")

.01 to .03 incl.
Over .03 to .05 incl.
Over .05 to .10 incl.

0.8% or .002", whichever value is greater

*The deviation from roundness is measured as the difference between major and minor outside diameters, as determined at any one cross-section of the tube.

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.

COPPER 47.

0.7% or .002", whichever value is greater



TOLERANCES FOR SEAMLESS COPPER TUBE

SFAMLESS TUBES

RECTANGULAR (Including SQUARE) -HEXAGONAL -OCTAGONAL

TABLE I-WALL THICKNESS TOLERANCES-In Inches

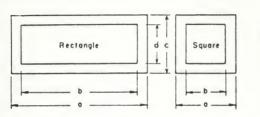
Tolerances are plus and minus; if tolerances all plus or minus are desired, double the values given. For rectangular tube, the major distance across flats determines the tolerance applicable to both major and minor distances.

	For Outside or Inside Dimensions Across Flats, In Inches								
Wall Thickness in Inches	1/32 to 1/8 incl.	Over 1/8 to 5/8 incl.	Over 5/8 to 1 incl.	Over 1 to 2 incl.	Over 2 to 4 incl.	Over 4 to 7 incl.	Over 7 to 10 incl.		
Under .018	.002 .003 .0035 .004	.002 .0025 .0035 .004 .005 .007 .009	.0025 .003 .0035 .0045 .006 .008 .010 .012	.003 .0035 .004 .005 .007 .009 .011 .013					

TABLE II-TOLERANCES ON DIMENSIONS ACROSS FLATS-In Inches

Tolerances are plus and minus; if tolerances all plus or minus are desired, double the values given. For rectangular tube, the major distance across flats determines the tolerance applicable to both major and minor distances.

Dimension "a" or "b" (see sketches) (In Inches)	Toler- ances (In Inches)	Dimension "a" or "b" (see sketches) (In Inches)	Toler- ances (In Inches)
Up to 1/8 inch	.003 .004 .005 .006	Over 3 to 4 incl Over 4 to 5 incl Over 5 to 6 incl Over 6 to 8 incl Over 8 to 10 incl	.008 .009 .010 .011 .012







Nominal dimension "a" determines tolerance applicable to both "a" and "c" Nominal dimension "b" determines tolerance applicable to both "b" and "d"



TOLERANCES FOR SEAMLESS COPPER TUBE

RECTANGULAR (Including SQUARE) -HEXAGONAL -OCTAGONAL

TABLE III

PERMISSIBLE RADII FOR COMMERCIALLY SHARP CORNERS

In Inches

For Wall Thicknesses	Maximum Radii				
(In Inches)	Outside Corners	Inside Corners			
Up to .058 inclusive	3/64 1/16 3/32 Not established	1/32 1/32 1/32 Not established			

SQUARENESS OF CUT (Applicable to Straight Lengths only):

The departure from squareness of the end of any tube shall not exceed the following:

per inch of dimension

LENGTH TOLERANCES: (Same as for Round Seamless Tube; see Page 46, this section.)

STRAIGHTNESS TOLERANCES: 1/2" maximum curvature (depth of arc) in any 6 foot portion of the total length.

Tolerances on a given tube may be specified with respect to any two, but not all three of the following: (a) Outside dimensions; (b) Inside dimensions; (c) Wall thickness.

TOLERANCES FOR COPPER PIPE

WEIGHT AND WALL THICKNESS TOLERANCES

Pipe Size	Weight Per Foot Tolerances	Wall Thickness Tolerances		
in Inches	Plus and Minus	Minus	Plus	
Up to 6 inclusive Over 6 to 8 inclusive Over 8	5% 7% 8%	5%* 7%* 8%*	Limited only by weight tolerances	

*Expressed to the nearest 0.001"

LENGTH TOLERANCES: Standard lengths 12 and 20 feet plus and minus 1/2".

SQUARNESS OF CUT TOLERANCES: Same as for Seamless Tube, see Page 47, this section.

ROUNDNESS TOLERANCES: Same as for Seamless Tube, see Page 47, this section.



COPPER PIPE

DIMENSIONS AND WEIGHTS-STANDARD PIPE SIZES

REGULAR

Pipe Size	Nominal	n Inches	Cross Sectional	Pounds	
in Inches	Outside Diameter	Inside Diameter	Wall Thickness	Area of Bore in Sq. In.	per Foot
1/8	.405	.281	.062	.062	.259
1/4	. 540	.376	.082	.110	.457
3/8	. 675	.495	.090	.192	. 641
1/2	.840	.626	.107	.307	.955
3/4	1.050	.822	.114	.531	1.30
1	1.315	1.063	.126	.887	1.82
1 1/4	1.660	1.368	.146	1.47	2.69
1 1/2	1.900	1.600	.150	2.01	3.20
2	2.375	2.063	.156	3.34	4.22
2 1/2	2.875	2.501	.187	4.91	6.12
3	3.500	3.062	.219	7.37	8.75
3 1/2	4.000	3.500	.250	9.62	11.4
4	4.500	4.000	.250	12.6	12.9
5	5.562	5.062	.250	20.1	16.2
6	6.625	6.125	.250	29.5	19.4
8	8.625	8.001	. 312	50.3	31.6
10	10.750	10.020	.365	78.8	46.2
12	12.750	12.000	.375	113.	56.5

EXTRA STRONG

Pipe	Nominal	Dimensions i	n Inches	Cross		
Size in Inches	Outside Diameter	Inside Diameter	Wall Thickness	Sectional Area of Bore in Sq. In.	Pounds per Foot	
1/8	.405	.205	.100	.033	.371	
1/4	. 540	.294	.123	.068	. 625	
3/8	. 675	.421	.127	.139	.847	
1/2	.840	. 542	.149	.231	1.25	
3/4	1.050	.736	.157	.425	1.71	
1	1.315	.951	.182	.710	2.51	
1 1/4	1.660	1.272	.194	1.27	3.46	
1 1/2	1.900	1.494	.203	1.75	4.19	
2	2.375	1.933	.221	2.94	5.80	
2 1/2	2.875	2.315	.280	4.21	8.85	
3	3.500	2.892	. 304	6.57	11.8	
3 1/2	4.000	3.358	.321	8.86	14.4	
4	4.500	3.818	.341	11.5	17.3	
5	5.562	4.812	.375	18.2	23.7	
6	6.625	5.751	.437	26.0	32.9	
8	8.625	7.625	.500	45.7	49.5	
10	10.750	9.750	.500	74.7	62.4	



TOLERANCES & WEIGHTS COPPER WATER TUBE

COPPER WATER TUBE FOR FLARED OR SOLDER-JOINT FITTINGS

Standard Dimensions, Weights, and Diameter and Wall Thickness Tolerances

(All Tolerances Plus and Minus except as otherwise indicated)

	Nominal Outside	Dia Tole:	Outside meter rances	Wall Thickness—In Inches				Theoretical Weight Pounds per Foot				
Standard Water	Diam- eter	in I	nches	Туре	K	Тур	e L	Type	M	100	ildo per	
Tube Size	in Inches	An- nealed	Hard Drawn	Nom- inal	Toler- ance	Nom- inal	Toler- ance	Nom- inal	Toler- ance	Type K	Type L	Type M
1/4 3/8 1/2 5/8 3/4 1 1 1/4 1 1/2	. 375 . 500 . 625 . 750 . 875 1. 125 1. 375 1. 625	.002 .0025 .0025 .0025 .003 .0035 .004	.001 .001 .001 .001 .001 .0015	.035 .049 .049 .049 .065 .065	.004 .004 .004 .004 .0045 .0045	.030 .035 .040 .042 .045 .050 .055	.0035 .0035 .0035 .0035 .004 .004	.025 .028 .032 .032 .035 .042	.0025 .0025 .0025 .003 .0035 .0035	0.145 0.269 0.344 0.418 0.641 0.839 1.04	0.126 0.198 0.285 0.362 0.455 0.655 0.884	0.145 0.204 0.328 0.465 0.682 0.94
2 2 1/2	2.125 2.625	.005	.002	.083	.007	.070	.006	.058	.006	2.06 2.93	1.75 2.48	1.46 2.03
3 3 1/2 4 5 6	3. 125 3. 625 4. 125 5. 125 6. 125	.005 .005 .005 .005	.002 .002 .002 .002 .002	.109 .120 .134 .160 .192	.007 .008 .010 .010	.090 .100 .110 .125 .140	.007 .007 .009 .010	.072 .083 .095 .109	.006 .007 .009 .009	4.00 5.12 6.51 9.67 13.9	3.33 4.29 5.38 7.61 10.2	2.68 3.58 4.66 6.66 8.92
8 10 12	8.125 10.125 12.125	.006 .008 .008	.002 .004 .002 .006 .002 .006	.271 .338 .405	.016 .018 .020	.200 .250 .280	.014 .016 .018	.170 .212 .254	.014 .015 .016	25.9 40.3 57.8	19.3 30.1 40.4	16.5 25.6 36.7

Variations from these weights must be expected in practice.

LENGTH TOLERANCES

An		Lengths Drawn (Hard) Ten	nper
Standard Size	Туре	Standard Length (Feet)	Length Tolerance (Inches)
Up to 8" incl. 10" only 10" only 12" only 12" only 12" only	K, L & M L & M K M L K	20 20 18 20 18 12	plus 1, minus 0
Up to 1" incl. 1 1/4 and 1 1/2 2		Lengths t) Temper Only 60 & 100 60 40 & 45	(Feet) plus 2, minus 0 plus 2, minus 0 plus 1, minus 0



TOLERANCES & WEIGHTS COPPER WATER TUBE

COPPER WATER TUBE FOR FLARED OR SOLDER-JOINT FITTINGS

TEMPERS: Types K and L - hard and soft tempers; Type M - hard temper only.

WEIGHT TOLERANCE: Tube shall not vary in weight by more than 7% from the theoretical weight given on the preceding page.

SQUARENESS OF CUT TOLERANCES: Same as for Seamless Tube, Page 47, this section.

ROUNDNESS TOLERANCES: Same as for Seamless Tube, Page 47, this section.

TOLERANCES & WEIGHTS COPPER THREADLESS PIPE (TP) (HARD DRAWN)

For Working Pressures up to 200 lbs. per Square Inch

STANDARD DIMENSIONS, WEIGHTS AND TOLERANCES

Standard Pipe Size In Inches	NOMINAL DIMENSIONS IN INCHES			Cross Sectional Area of	Nominal Weight	TOLERANCES	
						*Average Outside	Wall Thickness
	Outside Diameter	Inside Diameter	Wall Thick- ness	Bore In Sq. In.	Pounds per Foot	Diameter Tolerances All Minus	Tolerances Plus and Minus
1/4	0.540	0.410	0.065	0.132	0.376	0.004	.0035
3/8	0.675	0.545	0.065	0.233	0.483	0.004	.004
1/2	0.840	0.710	0.065	0.396	0.613	0.005	.004
3/4	1.050	0.920	0.065	0.665	0.780	0.005	.004
1	1.315	1.185	0.065	1.10	0.989	0.005	.004
1 1/4	1.660	1.530	0.065	1.84	1.26	0.006	.004
$1 \ 1/2$	1.900	1.770	0.065	2.46	1.45	0.006	.004
2	2.375	2.245	0.065	3.96	1.83	0.007	.006
2 1/2	2.875	2.745	0.065	5.92	2.22	0.007	.006
3	3.500	3.334	0.083	8.73	3.45	0.008	.007
3 1/2	4.000	3.810	0.095	11.4	4.52	0.008	.007
4	4.500	4.286	0.107	14.4	5.72	0.010	.009
5	5.562	5.298	0.132	22.0	8.73	0.012	.010
5 6 8	6.625	6.309	0.158	31.3	12.4	0.014	.010
8	8.625	8.215	0.205	53.0	21.0	0.018	.014
10	10.750	10.238	0.256	82.3	32.7	0.018	.016
12	12.750	12.124	0.313	115.4	47.4	0.018	.020

^{*}The average outside diameter of a tube is the average of the maximum and minimum outside diameters, as determined at any one cross-section of the tube.



TOLERANCES-COPPER THREADLESS PIPE

THREADLESS PIPE (TP)—COPPER (Hard Drawn)
For Working Pressures up to 200 lbs. per Square Inch

LENGTH AND TOLERANCES

Standard Pipe Size (In Inches)	Standard Length (In Feet)	Length Tolerances (In Inches)
Up to 10 incl.	20 15	plus 1, minus 0 plus 1, minus 0

SQUARENESS OF CUT

Same as for round seamless tube. See Page 47, this section.

ROUNDNESS TOLERANCES

Same as for round seamless tube. See Page 47, this section.

TOLERANCES AND WEIGHTS COPPER REFRIGERATION TUBE

Tolerances in Diameter and Wall Thickness
Standard Dimensions and Weights

	Standard I	Standard Dimensions and Weights			nces
Nominal Size, In.	Actual Outside Diameter, in.	Wall Thickness in.	Weight lb. per ft.	Average Outside Diameter (b) plus and minus, in.	Wall Thickness (a) plus and minus, in.
1/8	0.125	0.030	0.0347	0.002	0.003
3/16	0.187	0.030	0.0575	0.002	0.0025
1/4	0.250	0.030	0.0804	0.002	0.0025
5/16	0.312	0.032	0.109	0.002	0.0025
3/8	0.375	0.032	0.134	0.002	0.0025
1/2	0.500	0.032	0.182	0.002	0.0025
5/8	0.625	0.035	0.251	0.002	0.003
3/4	0.750	0.035	0.305	0.0025	0.0035

(a) The tolerances listed represent the maximum deviation at any point.

(b) The average outside diameter of a tube is the average of the maximum and minimum outside diameters as determined at any one cross-section of the tube.

TOLERANCES AND WEIGHTS OF COPPER DRAINAGE TUBE (DWV)

STANDARD DIMENSIONS AND WEIGHTS

All tolerances plus and minus except as otherwise indicated

	Nominal	Average* Outside	Wall Thickness (In Inches)		Theoretical Weight
Standard Size (In Inches)	Outside Diameter (In Inches)	Diameter Tolerances (In Inches)	Nominal	Toler- ance**	(In Pounds per Foot)
1 1/4	1.375	.0015	.040	.003	.650
1 1/2	1.625	.002	.042	.003	.809
2	2.125	.002	.042	.004	1.07
3	3.125	.002	.045	.004	1.69
4	4.125	.002	.058	.007	2.87
5	5.125	.002	.072	.008	4.43
6	6.125	.002	.083	.008	6.10
8	8.125	+.002004	.109	.011	10.6
				1	

^{*}The average outside diameter is the average of the maximum and minimum outside diameters as determined at any one cross-section of the tube.

LENGTH AND TOLERANCE

The standard length for tube furnished straight is 20 feet. The tolerance is plus 1 inch, minus 0.

TEMPER

Drawn Temper

ROUNDNESS TOLERANCE

Same as for round seamless tube. See Page 47, this section.

SQUARENESS OF CUT

Same as for round seamless tube. See Page 47, this section.

Copper Drainage Tube (DWV) conforms with ASTM designation B 306.

FOR BURSTING & WORKING PRESSURES OF COPPER TUBE

SEE BRASS SECTION, PAGES 78-81

These tolerance schedules are used by the Industry as applicable to commercial material, in the absence of other specifications by the purchaser.

^{**} Maximum deviation at any one point.

INTERNAL WORKING PRESSURES COPPER WATER TUBE AND JOINTS

TABLE I-RATED INTERNAL WORKING PRESSURES

(Pounds per Square Inch)

Based on the strength of the tube alone and applicable to systems using suitable mechanical joints.

Nominal		100			200		30	00	40	00
Size	(S	= 6000	psi)	(S =	(S = 5500 psi)		(S = 47)	50 psi)	(S = 3000 psi)	
				Coppe	r Water	Tube	Туре			
	K	L	M	К	L	M	K	L	K	L
1/4	1060	900		970	820		840	710	530	450
3/8	1170	800	560	1070	730	510	920	630	590	400
1/2	920	740	510	840	670	460	730	580	460	370
5/8	760	650		700	590		600	510	380	330
3/4	880	590	420	810	540	380	700	460	440	300
1	680	510	340	620	460	320	530	400	340	260
1 1/4	550	460	340	500	420	320	430	360	280	230
1 1/2	520	430	340	470	390	310	410	330	260	220
2	450	370	300	400	340	270	350	290	230	190
2 1/2	420	350	280	380	320	250	330	270	210	180
3	410	330	260	370	300	240	320	260	210	170
3 1/2	380	320	260	350	290	230	300	250	190	160
4	370	300	260	340	270	230	290	240	190	150
5	360	280	240	330	250	220	280	220	180	140
6	370	260	230	330	240	200	290	200	190	130
8	390	280	240	350	260	210	310	220	200	140
10	390	290	240	360	260	220	310	220	200	150
12	400	270	240	360	240	220	310	210	200	140

The values in Table I are based on the formula in the American Standard Code for Pressure Piping, ASA B31.1-1955.

$$t_{m} = \frac{PD}{2S + 0.8P} + C$$

tm = minimum tube wall thickness, in inches.

P = maximum rated internal working pressure, in pounds per square inch.

D = outside diameter of tube, in inches.

or

$$P = \frac{2 \, \mathrm{S} \, t_m}{D \, - \, 0.8 \, t_m} \ \text{when C is 0}$$

S = allowable stress in material due to internal pressure, at operating temperature, in pounds per square inch.

C = allowance for threading, mechanical strength and/or corsion, in inches = 0.

INTERNAL WORKING PRESSURES COPPER WATER TUBE AND JOINTS

TABLE II—RATED INTERNAL WORKING PRESSURES OF JOINTS MADE OF COPPER WATER TUBE AND SOLDER-TYPE FITTINGS

Pounds per Square Inch

Solder or Service Temperature		Copper Water Tube Nominal Sizes					
Brazing Alloy Used in Joints	zing Alloy Degrees		W: 1 1/4 to 2 incl.	ater (a) 2 1/2 to 4 incl.	5 to 8 incl.	10 to 12 incl.	Saturated Steam All
50-50 Tin-Lead (b)	100 150 200 250	200 150 100 85	175 125 90 75	150 100 75 50	130 90 70 50	100 70 50 40	 15 (c)
95-5 Tin-Antimony	100 150 200 250	500 400 300 200	400 350 250 175	300 275 200 150	150 150 150 140	150 150 140 110	 15 (c)
Brazing Alloys (Melting at or above 1000 F.)	250 (d) 350	300 270	210 190	170 150	150 150	150 150	120 (e)

The values in Table II are based on data in the National Bureau of Standards publications, "Building Materials and Structures Reports BMS 58 and BMS 83."

- (a) Including other noncorrosive liquids and gases
- (b) ASTM B32, Alloy Grade 50A
- (c) This pressure is determined by the temperature of saturated steam at 15 lb. pressure or 250 F.
- (d) For service temperatures lower than 250 F. the solders as above may be used.
- (e) This pressure is determined by the temperature of saturated steam at 120 lb. pressure or 350 F.





COPPER WIRE

Copper Wire stocked by Chase Metals Service Centers is Electrolytic Tough Pitch Copper, a grade entirely satisfactory for most general purposes. It is employed as conductivity wire for numerous electrical applications and in the fabrication of screens, nails, rivets and tacks. It is stocked in 25 to 250-lb. mill coils, with a choice of coil lengths available in most sizes. It is also available in 100-lb, and 500-lb, payoffpacks.



ELECTROLYTIC TOUGH PITCH COPPER WIRE

COPPER NO. 110

CHEMICAL COMPOSITION*

Copper, 99.9% min.

Oxygen, 0.04%

Electrolytic Tough Pitch Copper Wire is a widely accepted standard electrical conductivity wire suitable for most electrical applications. It is highly ductile and is readily drawn, formed, bent, headed, upset, forged, pressed, roll threaded, knurled and soldered. It is therefore selected for fabricating screening, contacts, electronic components, terminals, nails, rivets, tacks and soldering coppers.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100) Rating	Suitability for Being Joined by: Soft Soldering Excellent Brazing
Capacity for Being Hot Formed. Excellent Hot Forgeability Rating (Forging Brass = 100)	Carbon Arc Welding Fair Gas Shielded Arc Welding Fair Coated Metal Arc Welding Not Recom. Resistance Welding:
1400°-1600°F. or 750°-875°C. Annealing Temperature	Spot Not Recommended Seam Not Recommended Butt Good

MECHANICAL PROPERTIES*

	0.100 (0.025 mm Anneal)	0.100 Hard (60%)
Tensile Strength, p.s.i.	34,000	60,000
Yield Strength, p.s.i.	11,000	55,000
Shear Strength, p.s.i.	23,000	30,000
Elongation, % in 2-in.	45	6
Poekwell Hardness	_	

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1949	Liquidus 1981
Density, lbs., per cu. in. @ 68 F.	0.321-0.323
Specific gravity	8.89-8.94
Coefficient of Thermal Expansion	0.0000098 per °F. from 68 F. to 572 F.
Thermal Conductivity	226 Btu./sq. ft./ft./hr./°F. @ 68 F.
Electrical Resistivity (Annealed)	10.3 Ohms (circ. mil./ft.) @ 68 F.
Electrical Conductivity (Annealed)	101 % IACS @ 68 F.
Thermal Capacity (Specific Heat)	0.092 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension)	17,000,000 psi
Modulus of Rigidity	6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	83
A.S.T.M.	B1; B2; B3
A.M.S.	4701B
Federal	QQ-W-341a, Amend. #2
Military	MIL-W-5086

^{*}All Values nominal. Not to be used as specification requirements.





COPPER WIRE

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Oxygen, 0.04%

Electrolytic Tough Pitch Copper Wire is a widely accepted standard electrical conductivity wire suitable for most electrical applications. It is highly ductile and is readily drawn, formed, bent, headed, upset, forged, pressed, roll threaded, knurled and soldered. It is therefore selected for fabricating screening, contacts, electronic components, terminals, nails, rivets, tacks and soldering coppers.

FABRICATION PROPERTIES*

Machinability (Free-Cutting Brass = 100)	Suitability for Being Joined by;
Rating 20	Soft Soldering Excellent
Type of Chip L	Brazing
Capacity for Being Cold Worked .Excellent	Oxyacetylene Welding Not Recommended
Capacity for Being Hot FormedExcellent	Carbon Arc Welding Fair
Hot Forgeability Rating	Gas Shielded Arc Welding Fair
(Forging Brass = 100) 65	Coated Metal Arc Welding Not Recom.
Hot Working Temperature	Resistance Welding:
1400°-1600°F. or 750°-875°C.	Spot Not Recommended
Annealing Temperature	Seam Not Recommended
700°-1200°F. or 375°-650°C.	Butt

MECHANICAL PROPERTIES*

	0.100 (0.025 mm Anneal)	0.100 Hard (60%)
Tensile Strength, p.s.i.	34,000	60,000
Yield Strength, p.s.i.	11,000	55,000
Shear Strength, p.s.i.	23,000	30,000
Elongation, % in 2-in.	45	6
Poekwell Hardness		-

PHYSICAL PROPERTIES*

Melting Point, °F. Solidus 1949 Density, lbs., per cu. in. @ 68 F. Specific gravity Coefficient of Thermal Expansion Thermal Conductivity Electrical Resistivity (Annealed) Electrical Conductivity (Annealed) Thermal Capacity (Specific Heat)	Liquidus 1981 0.321-0.323 8.89-8.94 0.0000098 per °F, from 68 F, to 572 F, 226 Btu./sq. ft./ft./hr./°F, @ 68 F, 10.3 Ohms (circ. mil./ft.) @ 68 F, 101 % IACS @ 68 F, 0.092 Btu./lb./°F, @ 68 F,
Thermal Capacity (Specific Heat)	0.092 Btu./lb./°F. @ 68 F.
Modulus of Elasticity (Tension) Modulus of Rigidity	17,000,000 psi 6,400,000 psi

CHEMICALLY EQUIVALENT SPECIFICATIONS

S.A.E.	83
A.S.T.M.	B1; B2; B3
A.M.S.	4701B
Federal	QQ-W-341a, Amend. #2
Military	MIL-W-5086

^{*}All Values nominal. Not to be used as specification requirements.



COPPER WIRE

COPPER NO. 110

BARE-ROUND-HARD DRAWN

In Mill Coils

Diamet	er	Weight	Diameter		Weight
	Decimal Equivalent	Lbs.per 1000 Ft.		Decimal Equivalent	Lbs.per 1000 Ft.
Gauge	Inches	(Approx.)	Gauge	Inches	(Approx.)
No. 2 B. & S.	.2576	203.	NO.10 B. & S.	.1019	31.7
No. 4 B. & S.	. 2043	127.	NO.14 B. & S.	.0641	12.5
No. 8 B. & S.	. 1285	49.9	NO.16 B. & S.	.0508	7.86

BARE-ROUND-SOFT TEMPER

In Mill Coils

No. 2 B. & S.	.2576	203.	No.15 B. & S.	.0571	9.93
No. 6 B. & S.	.1620	79.9	No.16 B. & S.	.0508	7.86
No. 7 B. & S.	.1443	63.1	No.17 B. & S.	.0453	6.25
No. 8 B. & S.	. 1285	49.9	No. 18 B. & S.	.0403	4.94
No. 9 B. & S.	. 1144	39.6	No.19 B. & S.	.0359	3.92
No. 10 B. & S.	.1019	31.7	No.20 B. & S.	.0320	3.12
No.11 B. & S.	.0907	25.0	No. 21 B. & S.	.0285	2.47
No. 12 B. & S.	.0808	19.9	No.22 B. & S.	.0253	1.95
No. 13 B. & S.	.0720	15.8	No.24 B. & S.	.0201	1.23
No. 14 B. & S.	.0641	12.5	No.26 B. & S.	.0159	. 770

In Payoff Paks

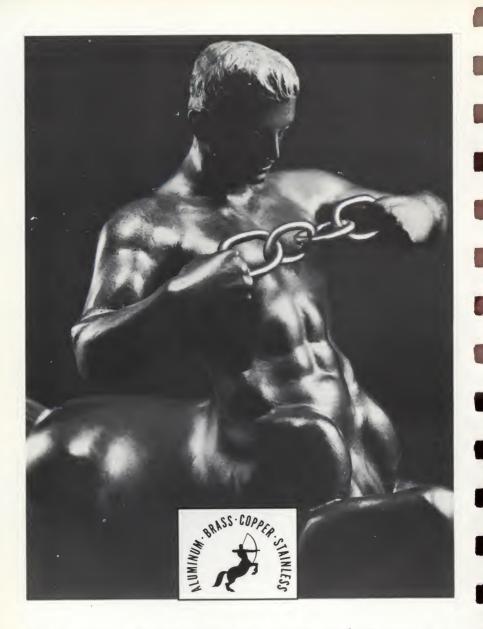
		Weight			Weight
No. 14 B. & S.	.0641	500 lbs.	No.20 B. & S.	.0320	100 lbs.
No. 17 B. & S.	.0453	500 lbs.	No. 24 B. & S.	.0201	100 lbs.
No. 18 B. & S.	.0403	100 lbs.	No.28 B. & S.	.0126	100 lbs.

Sizes other than listed can be furnished from Mill stocks.

TOLERANCES FOR COPPER WIRE (In Inches)

BARE WIRE, DRAWN TO FINAL SIZE

Diameter or Distance between Parallel Surfaces in Inches	Round	Hexagona Octagona
Up to .010 inclusive	.0001	
Over .010 to .020 inclusive	.0002	
Over .020 to .030 inclusive	.0003	
Over .030 to .040 inclusive	.0004	.0008
Over .040 to .050 inclusive	.0005	.0010
Over .050 to .060 inclusive	.0006	.0012
Over .060 to .080 inclusive	.0008	.0016
Over .080 to .150 inclusive	.0010	.002
Over .150 to .500 inclusive	.0015	.003
Over .500 to .750 inclusive	.002	.004



The Centaur links all four in a new metals service! Chase Multi-Metal Service supplies the metals you need—ALUMINUM, BRASS, COPPER, STAINLESS—from its many and diversified stocks. You name it; count on Chase to deliver it! Phone Chase. "One Call Gets All"—including metal-lurgical advisory service!

STAINLESS

BAR

TUBING

SHEET

PIPE

STRIP

ANGLES

PLATE

WIRE



CHASE METALS SERVICE

STAINLESS INDEX

BAR 2-17	SHEET, STRIP & PLATE 18-31
	Data
Data 8-17	Sheet
	Type 302/304 19-20
Rounds	Type 304ELC
	Type 310 21
Type 303 2-3	Type 316
Type 303 Se 2-3 Type 304 2-3-6	Type 316ELC 22
-76	Type 321 22
-)	Type 347 23
Type 321 2-3 Type 347 2-3	Type 410
Type 410 4,6	Type 430 23
Type 414 6	Strip
Type 416 3,4	Type 301 24
Type 416F 4	Type 302 24
Type 418 4	Type 304
Type 420 4	Type 321 24
Type 430F 4	Type 403 24
Type 440A 6	Type 430 24
Type 440C 4	Plate
Type 440 FSe 4	Type 202 25
	Type 304
	Type 310
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Type 303Se 5	2,700 == 0.0000000000000000000000000000000
Type 304 5	TUBING 32-42
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Squares	
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	Type 302
	Type 304 46
ANGLES	Type 305 45-46
	Type 410
Type 304	Type 418 45-46
Type 304	Type 430 45-46





STAINLESS BAR

Chase M and types rolled.

Chase Metals Service Division stocks a wide range of sizes and types of Stainless Bars in rounds—cold finished or hot rolled. Also stocked are hexes, squares and flats. We ly supply other types as well as other standard and special

can promptly supply other types as well as other standard and special sizes and finishes from mill stocks.

Bars can be supplied boxed or in bundles, burlap-wrapped, paper-wrapped, or bare. Bars can be supplied line-marked to conform to specifications.



STAINLESS BARS-ROUNDS

in Standard Stock Lengths

COLD FINISHED

(COLD DRAWN - CENTERLESS GROUND)

X = Stock Sizes*

Dia	Decimal Decimal		Weight Lbs. per			Тур	е		
Inches	Equivalent Inches	Finish	Lin. Ft. (Approx.)	303	303Se	304	316	321	347
3/32	.094	CD	.0235	X	X	-	-	-	-
1/8	.125	CD	.0531	X	-	X	-	-	-
1/8	.125	CG	.0531	X	-	-	-	-	-
5/32	.156	CD	.0652	X	-	-	-	-	-
3/16	.188	CD	.0939	X	-	X	X	X	-
3/16	.188	CG	.0939	X	-	-	-	-	-
7/32	.219	CD	.1278	X	-	-	-	-	-
7/32	.219	CG	.1278	X	-	-	-	-	-
1/4	.250	CD	.1669	X	-	X	X	-	X
1/4	.250	CG	.1669	X	-	-	-	-	-
17/64	.266	CD	.1884	X	-	-	-	-	-
9/32	.281	CD	.2112	X	X	-	-	-	-
9/32	.281	CG	.2112	X	-	-	-	-	-
5/16	.313	CD	.2607	X	X	-	X	-	-
5/16	.313	CG	.2607	X	-	-	-	-	-
11/32	.344	CD	.3155	X	-	-	-	-	-
11/32	.344	CG	.3155	X	-	-	-	-	_
3/8	.375	CD	.3755	X	-	X	X	-	X
3/8	.375	CG	.3755	X	-	-	-	-	-
13/32	.406	CD	.4406	X	-	-	-	-	-
7/16	.438	CD	.5111	X	-	-	-	X	-
7/16	.438	CG	.5111	X	-	-	-	-	-
15/32	.469	CD	.5867	X	-	-	-	-	-
1/2	.500	CD	.6675	X	-	X	X	X	X
1/2	.500	CG	.6675	X	-	X	-	-	-
17/32	.531	CG	.7536	X	-	-	X	-	-
9/16	.563	CD	.8448	-	-	-	-	X	-
9/16	.563	CG	.8448	X	-	-	-	-	-
5/8	.625	CD	1.043	_	-	-	X	X	-
5/8	.625	CG	1.043	X	X	X	X	-	X
11/16	.688	CD	1.262	X	-	-	-	-	-
11/16	.688	CG	1.262	X	X	X	-	-	-
3/4	.750	CD	1.502	-	-	-	X	X	-
3/4	.750	CG	1.502	X	-	X	X	-	-
13/16	.813	CG	1.763	X	X	X	-	X	-

Continued

See following pages for additional types.

^{*}Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.



STAINLESS BARS-ROUNDS

In Standard Stock Lengths

COLD FINISHED

(COLD DRAWN - CENTERLESS GROUND)

Continued

X = Stock Sizes*

Di	ameter	_	Weight				Туре			
	Decimal		Lbs. per Lin. Ft.				Type			
Inches	Equivalent Inches	Finish	(Approx.)	303	303Se	304	316	321	347	
27/32	.844	CG	1.901	_	_	-	X	-	-	
7/8	.875	CD	2.044	-	-	-	X	-	-	
7/8	.875	CG	2.044	X	-	X	X	X	-	
15/16	.938	CG	2.347	X	-	X	-	X	-	
31/32	.969	CG	2.506	X	-	-	-	-	-	
1	1.000	CG	2.670	x	-	X	X	X	X	
1 1/16	1.063	CG	3.015	X	-	X	-	-	-	
1 1/8	1.125	CG	3.380	X	-	-	-	X	-	
1 3/16	1.188	CG	3.766	X	-	X	X	-	-	
1 1/4	1.250	CG	4.172	X	-	X	X	X	X	
1 5/16	1.313	CG	4.600	X	-	-	-	-	X	
1 3/8	1.375	CG	5.049	X	X	X	-	-	-	
1 7/16	1.438	CG	5.518	X	-	-	-	-	X	
1 1/2	1.500	CG	6.009	X	-	X	X	-	X	
1 9/16	1.563	CG	6.519	X	-	-	-	X	-	
1 5/8	1.625	CG	7.051	X	_	X	-	X	-	
1 11/16	1.688	CG	7.604	X	-	-	-	-	-	
1 3/4	1.750	CG	8.178	X	-	-	X	-	X	
1 13/16		CG	8.773	X	-	-	X	-	-	
1 7/8	1.875	CG	9.388	X	-	X	X	-	-	
1 15/16	1.938	CG	10.02	-	-	_	X	-	-	
2	2.000	CG	10.68	X	-	-	X	-	-	
2 1/8	2.125	CG	12.06	X	X	-	-	-	-	
2 3/16	2.188	CG	12.78	X	-	-	-	-	-	
2 1/4	2.250	CG	13.52	X	X	X	-	-	-	
2 3/8	2.375	CG	15.06	X	-	-	-	-	-	
2 1/2	2.500	CG	16.69	X	-	-	X	-	-	
2 5/8	2.625	CG	18.40	-	-	X	X	-	-	
3	3.000	CG	24.03	X	-	-	-	-	-	
3 1/4	3.250	CG	28.21	-	-	X	-	-	-	
3 3/8	3.375	CG	30.42	X	-	_	-	-	-	
3 1/2	3.500	CG	32.71	-	-	-	X	-	-	
3 7/8	3.875	CG	40.10	X	-	-	-	-	-	
5	5.000	CG	66.76	X	-	-	-	-	-	
3/32	.094	CD	.0235	_	-	-	-	_	-	416
1/8	.125	CD	.0531	-	-	-	-	-	-	X
1/8	.125	CG	.0531	-	-	-	-	-	-	X
5/32	.156	CD	.0652	-	-	-	-	-	-	X
5/32	.156	CG	.0652	-	-	-	_	_	_	X

^{*}Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.

See following pages for additional types.

STAINLESS BARS-ROUNDS

In Standard Stock Lengths

COLD FINISHED

(COLD DRAWN - CENTERLESS GROUND) X = Stock Sizes*

Dia	Decimal		Weight Lbs. per				Т	ype			
Inches	Equivalent Inches	Finish	Lin. Ft. (Approx.)	410	416	416 F	418	420	430 F	440C	440
3/16	.188	CD	.0939	-	X	-	-	-	X	-	-
3/16 7/32	.188 .219	CG CD	.0939 .1278	_	X	_	_	_	_	-	-
7/32	.219	CG	.1278	-	X	-	-	-	-	-	-
1/4	.250	CD	.1669	-	X	-	-	-	X	-	-
1/4	.250	CG	.1669	-	X	-	-	_	-	-	_
9/32	.256 .281	CD CD	.1750 $.2112$	_	X	_	_	_	X	_	-
9/32	.281	CG	.2112	-	X	-	-	-	-	-	-
5/16	.313	CD	.2607	-	X	-	-	-	-	-	-
	.322 .325	CD CD	.2768 .2820	-	X	_	x	_	-	_	_
11/32	.344	CD	.3155	_	X	-	_	-	-	-	-
11/32	.344	CG	.3155	-	X	-	-	-	-	-	-
_	-345/.348	CD	.3206	-	X	-	-	-		-	_
3/8	.375 .375	CD CG	.3755 .3755	_	X	X	-	-	X -	-	_
3/8 13/32	.406	CD	.4406	_	X	_	_	_	_	-	-
7/16	.438	CD	.5111	-	X	X	X	-	-	-	-
7/16	.438	CG	.5111	-	X	-	-	-	-	-	-
15/32	.469	CD CD	.5867 .6675	-	X	X	X	-	_	X	x
1/2 1/2	.500	CG	.6675	_	X	-	-	-	-	-	-
17/32	.531	CG	.7536	-	X	-	-	-	-	-	-
9/16	.563	CD	.8448	-	X	X	-	-	-	-	-
9/16 19/32	.563 .594	CG CG	.8448 .9413	-	X	_	_	-	X -	_	_
5/8	.625	CG	1.043	X	X	-	X	-	-	-	-
21/32	.656	CG	1.150	-	X	-	-	-	-	-	-
11/16	.688	CG	1.262	-	X	-	_	_	-	-	_
23/32 3/4	.719 .750	CG CG	1.379 1.502	x	X	_	_	_	x	_	_
13/16	.813	CG	1.763	-	X	-	-	-		-	-
7/8	.875 .938	CG CG	2.044 2.347	-	X	-	-	X	X	-	_
15/16		CG	2.670	X	X	_		x	_	_	_
1 1 1/16	1.000 1.063	CG	3.015	X	X	_	_	X	X	-	-
1 1/8	1.125	CG	3.380	-	X	-	-	-	X	-	-
1 3/16 1 1/4	1.188 1.250	CG CG	3.766 4.172	X	X	-	-	X -	x	_	-
1 5/16	1.313	CG	4.600	_	X	_	_	_	_	_	_
1 3/8	1.375	CG	5.049	-	X	-	-	-	X	-	-
1 7/16	1.438	CG	5.518	-	X	-	-	X	x	-	-
1 1/2 1 9/16	1.500 1.563	CG CG	6.009 6.519	X	X	_	-	-	_	_	_
1 5/8	1.625	CG	7.051	_	X	_	_	X	_	-	-
1 3/4	1.750	CG	8.178	X	X	-	-	-	-	-	-
1 7/8	1.875	CG	9.388	-	X	-	-	-	-	-	_
$\frac{2}{21/16}$	2.000 2.063	CG CG	$10.68 \\ 11.36$	_	X	_	_	x	_	_	_
2 1/8	2.125	CG	12.06	_	X	_	_	X	_	_	-
2 1/4	2.250	CG	13.52	-	X	-	-	-	-	-	-
2 3/8	2.375	CG	15.06	-	X	-	-	-	-	_	-
2 1/2 2 5/8	2.500 2.625	CG CG	16.69 18.40	_	_	_	_	X	-	_	_
4. STAI											

STAINLESS BARS-HEXAGONS

In Standard Stock Lengths
COLD DRAWN
X = Stock Sizes

Dia	Decimal	Weight Lbs. per			Type		
Inches	Equivalent Inches	Lin. Ft. (Approx.)	303	303Se	304	316	32
1/8	.125	.0460	X				-
16	.188	.1035	X			_	-
/4	.250	.1840	X				-
5/16	.313	.2875	X	_	X		-
1/32	.344	.3479	X	-			_
3/8 7/16	.375 .438	.4141 .5636	X X		X X		X
1/16	.500	.7361	X		X		>
9/16	.563	.9316	X		X	X	>
5/8	.625	1.150	X	-	X	X	>
11/16	.688	1.392	X	X	X	X	2
3/4	.750	1.656	X	_	X	X	2
13/16	.813	1.944	X	X	X	X	2
7/8	.875	2.254 2.588	X X	-	X	X X	2
15/16	.938				x	x	>
l l 1/16	1.000 1.063	2.944 3.324	X X	X	_	_	-
1 1/10	1.125	3.726	X	_	x	X	7
1 3/16	1.188	4.152	X	_	X		-
1 1/4	1.250	4.601	X		X	X	-
1 3/8	1.375	5.567	x		X		2
1 7/16	1.438	6.084					2
1 1/2	1.500	6.626	X		X	X	-
1 5/8	1.625	7.774	X	-	X	X	2
1 3/4	1.750	9.017 9.673			X		-
1 13/16	1.813	10.35	x		11		
1 7/8 2	1.875 2.000	11.78	X			X	
2 1/8	2.125	13.30	X		X		-
2 1/4	2,250	14.91	X	-			-
2 1/2	2,500	18.40	X	_	_		
2 3/4	2.750	22.27	X		-		-
			347	416	Type 430 F	440 F	17-4 P
1/8	.125	.0460		X			
3/16	.188	.1035		X			
3/8	.375	.4141		x		-	
7/16	.438	.5636		X		_	
1/2	.500	.7361		X		X	
9/16	.563	.9316	X	X X	X	×	X
5/8	.625	1.150 1.392	X	X	A	_	_
11/16 3/4	.688 .750	1.656	X	X			X
$\frac{3}{4}$.813	1.944	_	X	_		_
	.875	2.254	-	X		X	
	.010			X			X
7/8	.938	2.588					
7/8 15/16 1	.938 1.000	2.944	_	X		X	
7/8 15/16 1 1 1/8	.938 1.000 1.125	2.944 3.726		X X	_		X
7/8 15/16 1 1 1/8 1 3/16	.938 1.000 1.125 1.188	2.944 3.726 4.152	-	X -			X X
7/8 15/16 1 1 1/8 1 3/16 1 1/4	.938 1.000 1.125 1.188 1.250	2.944 3.726 4.152 4.601	 	х - х	-		X
7/8 15/16 1 1 1/8 1 3/16 1 1/4 1 3/8	.938 1,000 1.125 1.188 1.250 1.375	2.944 3.726 4.152 4.601 5.567	- - -	x x x		_ x _	X X
7/8 15/16 1 1 1/8 1 3/16 1 1/4 1 3/8 1 1/2	.938 1,000 1,125 1,188 1,250 1,375 1,500	2,944 3,726 4,152 4,601 5,567 6,626	_ _ _	x x x x	- - - -		X X
7/8 15/16 1 1 1/8 1 3/16 1 1/4 1 3/8 1 1/2 1 5/8	.938 1,000 1.125 1.188 1.250 1.375	2.944 3.726 4.152 4.601 5.567	- - -	x x x	- - - - - -	_ x _ x	x x - -
7/8 15/16 1 1 1/8 1 3/16 1 1/4 1 3/8 1 1/2 1 5/8 1 7/8	.938 1.000 1.125 1.188 1.250 1.375 1.500 1.625	2,944 3,726 4,152 4,601 5,567 6,626 7,774	- - - -	x x x x x	- - - -		X X - - - -
7/8 15/16 1 1 1/8 1 3/16 1 1/4 1 3/8 1 1/2 1 5/8 1 7/8 2 2 3/16	.938 1.000 1.125 1.188 1.250 1.375 1.500 1.625 1.875	2.944 3.726 4.152 4.601 5.567 6.626 7.774	- - - -	x x x x x x	- - - -		x x - - -

STAINLESS BARS-SQUARES

In Standard Stock Lengths

COLD DRAWN

X = Stock Sizes*

Di	ameter	Weight		
	Decimal Equivalent	Lbs. per Lin. Ft.	Ту	pe
Inches	Inches	(Approx.)	303	416
1/8	.125	.0531	X	-
1/4	.250	.2125	X	X
3/8	.375	.4781	X	_
5/8	625	1 3280	X	X

STAINLESS BARS-ROUNDS

In Standard Stock Lengths

HOT ROLLED

X = Stock Sizes*

Di	Decimal Decimal	Weight Lbs. per				Type		
Inches	Equivalent Inches	Lin. Ft. (Approx.)	Finish ^a	304	316	410	414	440 <i>A</i>
1/4	.250	.1669	HR-FQ	X				
5/16	.313	.2607	HR-FQ	X		-		
3/8	.375	.3755	HR-FQ	X	X	_		
7/16	.438	.5111	HR-FQ	X	X			_
1/2	.500	.6675	HR-FQ	X	X		_	-
9/16	.563	.8448	HR-FQ	X	_			-
5/8	.625	1.043	HR	X	-	-		
5/8	.625	1.043	HR-FQ	X	X	-		
3/4	.750	1.502	HR	X	-		-	-
3/4	.750	1.502	HR-FQ	X	X	-	-	
7/8	.875	2.044	HR	X		_	_	
7/8	.875	2.044	HR-FQ	X	X			
l l	1.000	2.670	HR	X				
	1.000	2.670	HR-FQ	X	X	_		
1 1/16	1.063	3.015	HRA	_		-	X	
1 1/8	1.125	3.380	HR	X				_
1/8	1.125	3.380	HRA			_	X	
1/8	1.125	3.380	HR-FQ	X	-			
1 3/16	1.188	3.766	HRA	_			X	_
1 1/4	1.250	4.172	HR	X			_	
1 1/4	1.250	4.172	HR-FQ	X	-			_
1 3/8	1.375	5.049	HR	X	_		_	
1 3/8	1.375	5.049	HRA	-	-		X	-
$1 \ 1/2$	1.500	6.009	HRA	_		-		X
1 5/8	1.625	7.051	HR	X		-		
1 5/8	1.625	7.051	HRA	-		_	X	X
2	2.000	10.68	HRA	-			X	
2 3/8	2.375	15.06	HR			X		
2 3/4	2.750	20.20	HRA				X	
3 3/8	3.375	30.42	HRA				X	
6	6.000	96.13	HR	-	X		_	_

** Other types, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.



STAINLESS FLATS

TYPE 304

In Standard Stock Lengths

HOT ROLLED, ANNEALED AND PICKLED

X = Stock Sizes*

Size Inches	Weight Lbs. per Lin. Ft. (Approx.)	Size Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/8 x 1/2	.2125	1/4 x 3	2.55
1/8 x 3/4	.3188	1/4 x 3 1/2	2.98
1/8 x 1	.4250	1/4 x 4	3.40
1/8 x 1 1/2	.638		
1/8 x 2	.850	5/16 x 1/2	.531
3/16 x 3/8	.239	3/8 x 3/4	.957
$3/16 \times 3/6$ $3/16 \times 3/4$.478	3/8 x 1	1.28
3/16 x 1	.638	3/8 x 1 1/2	1.92
$3/16 \times 1$ $1/4$.797	3/8 x 2	2.55
3/16 x 1 3/8	.875	3/8 x 3	3.83
$3/16 \times 1 \ 3/6$ $3/16 \times 1 \ 1/2$.957		
3/16 x 1 1/2 3/16 x 2	1.28	1/2 x 3/4	1.275
3/10 X Z	1.20	1/2 x 1	1.70
1/4 x 1/2	.425	1/2 x 1 1/2	2.55
$1/4 \times 1/2$ $1/4 \times 3/4$.636	1/2 x 2	3.40
	.850	1, 2	
$1/4 \times 1$	1.06	5/8 x 2 1/2	5.31
$1/4 \times 1 \cdot 1/4$	1.28	0,02.1,2	
$1/4 \times 1 1/2$	1.70	1 x 1 3/4	5.95
$1/4 \times 2$	1.70	1 1 1 0/ 1	

STAINLESS ANGLES

TYPE 304

In Standard Stock Lengths

HOT ROLLED, ANNEALED AND PICKLED

X = Stock Sizes

3/4 x 3/4 x 1/8	.59	2 x 2 x 1/8 2 x 2 x 3/16	1.65 2.44
1 x 1 x 1/8	.80	2 x 2 x 1/4	3.19
1 x 1 x 3/16	1.16		
1 1/4 x 1 1/4 x 1/8	1.01	2 1/2 x 2 1/2 x 3/16 2 1/2 x 2 1/2 x 1/4	3.07 4.10
1 1/2 x 1 1/2 x 1/8 1 1/2 x 1 1/2 x 3/16	1.23 1.80	3 x 3 x 1/4	4.68

^{*}Other types and sizes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.

CHASE STAINLESS STEEL

STANDARD TOLERANCES - HOT ROLLED BARS

SIZE TOLERANCES - STRAIGHT LENGTHS

ROUNDS AND SQUARES

Size-Inches	Size Toler Over	unce-Inches Under	Out-of-round (1) or out-of-square section (2)—inches
1/4 to 5/16 incl (3)	(4)	(4)	(4)
over incl			
5/16 to 7/16 (3)	.006	.006	.009
7/16 to 5/8 ⁽³⁾	.007	.007	.010
5/8 to 7/8	.008	.008	.012
7/8 to 1	.009	.009	.013
1 to 1 1/8	.010	.010	.015
1 1/8 to 1 1/4	.011	.011	.016
1 1/4 to 1 3/8	.012	.012	.018
1 3/8 to 1 1/2	.014	.014	.021
1 1/2 to 2	1/64	1/64	.023
2 to 2 1/2	1/32	0	.023
2 1/2 to 3 1/2	3/64	0	.035
3 1/2 to 4 1/2	1/16	0	.046
4 1/2 to 5 1/2	5/64	0	.058
5 1/2 to 6 1/2	1/8	0	.070
6 1/2 to 8	5/32	0	.085

(1) Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same cross section.

(2) Out-of-square section is the difference in the two dimensions at the same cross section of a square bar, each dimension being the distance between opposite faces.

(3) Round sections in the size range of 1/4 inch to approximately 5/8 inch diameter are commonly produced on rod mills in coils. Tolerances on the product made this way have not been established; for such tolerances—consult your Chase Metals Service Division Office. Variations in size of coiled product made on rod mills are greater than size tolerances for product made on bar mills.

(4) Squares in this size are not commonly produced as hot rolled product.

HEXAGONS AND OCTAGONS

Sizes measured between opposite sides—inches	Size Toler	ance-inches	Maximum difference inches, 3 measure-ments for hexagons	
	Over	Under	only	
1/4 to 1/2 incl	.007	.007	.011	
1/2 to 1	.010	.010	.015	
1 to 1 1/2	.021	.021	.025	
1 1/2 to 2	1/32	1/32	1/32	
2 to 2 1/2	3/64	3/64	3/64	
2 1/2 to 3 1/2	1/16	1/16	1/16	

FLATS

Width Inches	Thick	Width tolerance inches			
litelies	1/8 to 1/2 incl	Over 1/2 to 1 incl	Over 1 to 2 incl	Over	Under
To 1 incl	.008	.010	-	1/64	1/64
1 to 2	.012	.015	1/32	1/32	1/32
2 to 4	.015	.020	1/32	1/16	1/32
4 to 6	.015	.020	1/32	3/32	1/16
6 to 8	.016	.025	1/32	1/8	5/32
8 to 10	.021	.031	1/32	5/32	3/16

DATA

CHASE METALS SERVICE



CHASE STAINLESS STEEL

STANDARD TOLERANCES - HOT ROLLED BARS - STRAIGHT LENGTHS

LENGTH TOLERANCES - HOT ROLLED BARS

Sizes of rounds, squares, hexagons, octagons and widths of flats, inches	Tolerance—inches					
	To 12	ft incl	Over 12 to 25 ft incl			
	Over	Under	Over	Under		
To 2 incl	1/2	0	3/4	0		
Over 2 to 4 incl	3/4	0	1	0		
Over 4 to 6 incl	1	0	1 1/4	0		
Over 6 to 9 incl	1 1/4	0	1 1/2	0		
Over 9 to 12 incl	1 1/2	0	2	0		

LENGTH TOLERANCES - HOT ROLLED BARS

MACHINE-CUT AFTER MACHINE STRAIGHTENING

Sizes of rounds, squares, hexagons, octagons and widths of flats, inches	Tolerance-inches				
	To 12 ft incl		Over 12 to 25 ft incl		
	Over	Under	Over	Under	
To 3 incl	1/8 3/16 1/4 1/2	0 0 0	3/16 1/4 5/16 1/2	0 0 0	

STRAIGHTNESS TOLERANCES

MACHINE STRAIGHTENED

1/8" in any 5 ft; but may not exceed

$$1/8$$
" x No. of feet in length $\frac{1}{5}$

STAINLESS 9.

CHASE STAINLESS STEEL

STANDARD TOLERANCES - COLD FINISHED BARS SIZE TOLERANCES - STRAIGHT LENGTHS

ROUNDS OVER 1/2"

	Tolerance-	-inches (1)
Size-inches	Over	Under
Over 1/2 to 1 excl	.002 .0025 .003	.002 .0025 .003

- (1) When it is necessary to heat treat or heat treat and pickle after cold finishing, because of special hardness or mechanical property requirements, tolerances are commonly double those shown above.
- (2) Tolerances for sizes over 4 inches-Consult your Chase Metals Service Division Office.

ROUNDS 1/2" AND UNDER

	Tolerance—inches		
Size-inches	Over	Under	
1/2 only	.002 .0015 .001	.002 .0015 .001	

SQUARES, HEXAGONS AND OCTAGONS

	Toleranc	e-inches
Size-inches	Over	Under
Over 1/2 to 1 incl	0	.004
Over 1 to 2 incl	0	.006
Over 2 to 3 incl	0	.008
Over 3	0	.010

See footnotes (1) and (2) under COLD FINISHED ROUNDS above.

FLATS

	111110			
	Width tolerance—inches over and under ⁽¹⁾			
Width—inches	For thicknesses 1/4 in. and under	For thicknesses over 1/4 in.		
3/8 to 1 incl	.004 .006 .008 .010	.002 .003 .004 .005		
Thickness-inches	Thickness tolerance—inches over and under (1)			
1/8 to 1 incl	.002 .003 .004 .005			

- (1) When it is necessary to heat treat and pickle after cold finishing, because of hardness or mechanical property requirements, tolerances are commonly double those shown above.
- (2) Width and thickness tolerances over 4 1/2 inches—Consult your Chase Metals Service Division Office.



CHASE STAINLESS STEEL

STANDARD TOLERANCES - COLD FINISHED BARS
STRAIGHT LENGTHS

LENGTH TOLERANCES

COLD FINISHED BARS

(Except Cold Finished Rounds and Squares 1/2" and Under)

Sizes of rounds, squares, hexagons, octagons and widths of flats, inches	Tolerance—inches				
	To 12 ft incl		Over 12 to 25 ft incl		
	Over	Under	Over	Under	
To 2 incl	1/2	0	3/4	0	
Over 2 to 4 incl	3/4	0	1	0	
Over 4 to 6 incl	1	0	1 1/4	0	
Over 6 to 9 incl	1 1/4	0	1 1/2	0	
Over 9 to 12 incl	1 1/2	0	2	0	

COLD FINISHED BARS

MACHINE-CUT AFTER MACHINE STRAIGHTENING

(Except Cold Finished Rounds and Squares 1/2" and Under)

Sizes as they apply to rounds,	Tolerance—inches					
squares, hexagons, octagons	To 12	ft incl	Over 12 to 25 ft incl			
and widths of flats, inches	Over	Under	Over	Under		
To 3 incl	1/8 3/16 1/4 1/2	0 0 0 0	3/16 1/4 5/16 1/2	0 0 0		

COLD FINISHED ROUNDS AND SQUARES 1/2" AND UNDER

Tolerance-inches			
Over	Under		
1/4	0		

STRAIGHTNESS TOLERANCES

MACHINE STRAIGHTENED

1/16" in any 5 ft; but may not exceed

1/16" x No. of feet in length $\frac{1}{5}$



TYPICAL MECHANICAL PROPERTIES CHROMIUM NICKEL STAINLESS STEELS

Yield Strength	Ultimate	Elonga-	Reduc-	Izod	Hard	ness
0.2% Offset	Strength psi (x 1000)	tion in 2''	of Area %	Impact Strength Ft-Lbs	BHN	Rock- well
	00 105	05.55	E0 C0			B90-100
				_		C25- 45
	75- 90	40-55	50-60	60-110	150-228	B81- 98
	90-125	40-65	50-80			B90-100
	130-210 75- 90	10-25 40-70	40-55 50-80	85-120	150-228	C25 - 45 B81 - 98
/4 60- 90	85-120	40-65	50-80			B90-100
3/4 25- 35	65- 80	40-70	50-80	80-120	140-210	B78- 95
	90-125 75- 90	40 - 65 40 - 65	50-80 50-75	80-120	150-228	B90-100 B81- 98
	95-130 75- 95	40-65 40-65	50-80 50-75	80-120	 150-228	B95-C26 B81- 98
	95-130 75-100	40-65 40-60	50-80 50-75	- 80-120	_ 150-228	B95-C26 B81- 98
/4 65- 95	90-125	40-65	40-80			B90-100
	115-190 75- 95	10-25 40-60	40-55 50-75	- 70-120	- 150-228	C20- 40 B81- 98
	85-120 65- 85	40-65 40-60	50-80 50-75	- 80-120	_ 140-200	B90-100 B78- 94
/4 65- 95	90_125	40-60	50-75			B90-100
/4 100-185	130-210 75- 95	10-25 40-60	40-55 50-75	- 80-120	_ 150-228	C25- 45 B81- 98
65- 95	90-125	40-60	50-75		_	B90-100
	130-210 75- 95	10-25 40-60	40-55 50-75	- 80-120	 150-228	C25- 45 B81- 98
	Strength 0.2% Offset psi (x 1000) 4 65- 95	Strength 0.2% Offset psi (x 1000) (x 10	Strength 0.2% Offset psi (x 1000) (x 10	Strength O.2% Offset psi (x 1000) (x 10	Strength 0.2% Offset psi (x 1000)	Strength 0.2% Strength of 10.2% Strength psi (x 1000)



TYPICAL MECHANICAL PROPERTIES FERRITIC CHROMIUM STAINLESS STEELS

Type	Size	Yield Strength	Ultimate Tensile	Elonga-	Reduc-	Izod	Hard	ness
and Condition	Rd. Inches	0.2% Offset psi (x 1000)	Strength psi (x 1000)	tion in 2'' %	of Area %	Impact Strength Ft-Lbs	BHN	Rock- well
Type 405 C.D. Annealed Annealed	1/8-3/4 Over 3/4	40- 60 35- 50	75- 95 65- 80	20-30 20-40	55-65 55-70	_ 25- 85	_ 130-180	B85- 95 B72- 89
Type 430 C.D. Annealed Annealed	1/8-3/4 Over 3/4	45- 65 40- 55	75- 95 70- 85	20-30 20-35	55-65 50-65	 4-85	_ 130-170	B85- 95 B72- 87
Type 446 C.D. Annealed Annealed	1/8-3/4 Over 3/4	50 - 70 40 - 55	80-100 70- 85	10-25 15-30	35-55 45-60	_ 1-20	_ 140-187	B80-100 B77- 91

TYPICAL MECHANICAL PROPERTIES MARTENSITIC CHROMIUM STAINLESS STEELS

Type	Size	Yield Strength	Ultimate Tensile	Elonga-	Reduc-	Izod	Hard	ness
and Condition	Rd. Inches	0.2% Offset psi (x 1000)	Strength psi (x 1000)	tion in 2'' %	of Area %	Impact Strength Ft-Lbs	BHN	Rock- well
Type 403-410								
C.D. Annealed	1/8-3/4	55- 75	80-100	20-40	50-70		-	B85- 95
Annealed	Over 3/4	32- 42	60 - 75	20-40	50-75	85-120	140-200	B77- 95
Heat Treated	All	80-100	105-125	15-25	50 - 65	_	217-258	C18- 26 C26- 32
Heat Treated	All	100-120	125-145	15-25	50-65	_	258-302	C20- 32
Type 414								
C.D. Annealed	1/8-3/4	85-105	115-140	15-25	50 - 70	-		C20- 30
Annealed	Over 3/4	70 - 95	110-135	15-25	50-70	35- 65	225-285	C20- 30
Type 416								
C.D. Annealed	1/8-3/4	55- 75	80-100	20-30	50-65	_	_	B85- 95
Annealed	Over 3/4	32- 42	60 - 75	20-35	50-70	_	140-200	B77- 95
Best Machining	All	75-100	100-125	10-25	50-60	-	197-248	B92-C24
Heat Treated	All	100-120	125-145	10-25	50-60	_	258-302	C26- 32
Type 418 Spl.								
C.D. Annealed	1/8-3/4	105-125	130-150	15-25	50-70	_		C27- 33
Annealed	Over 3/4	90-110	125-145	15-25	50-70	50 - 75	260-310	C27- 33
Type 420								
C.D. Annealed	1/8-3/4	80-100	105-125	15-25	40-60			B90-100
Annealed	Over 3/4	50- 65	85-100	15-25	40-60	_	170-210	B86- 95
Type 422								
Annealed	Over 1/2	70- 95	100-125	15-25	45-65	50 - 70	200-260	B93-C27
Type 431								
C.D. Annealed	1/8-3/4	100-120	125-150	15-25	35-55		_	C25- 32
Annealed	Over 3/4	90-110	120-145	15-25	45-65	40-70	240-290	C23 - 31
Type 440A C.D. Annealed	1/8-3/4	80-100	105-125	15-30	20-35	_	_	B96-C25
Annealed	Over 3/4	55- 70	95-115	20-30	35-55	_	200-240	B93-101
	OVC1 0/ 1	00 10	00 110	20 00	00.00			
Type 440C C.D. Annealed	1/8-3/4	90-110	115-135	10-20	20-35		_	C22- 28
Annealed	Over 3/4	65- 80	105-125	10-20	20-35	_	230-270	C20- 28
Aimeareu	OVE1 0/ 1	00- 00	100-120	20-20	20 00			
							STA	INLESS 13.



MACHINING OPERATIONS - CHASE STAINLESS STEEL

CUTTING SPEEDS WITH FORMING TOOLS OF HIGH SPEED STEEL

Grade

Speed

The Free Machining Grades
Types 416 and 430 F

140 fpm at .0012 ipr feed

The Free Machining Grade
Type 303

95 fpm at .0012 ipr feed

Other Grades

65-85 fpm at .001 ipr feed

Finish speeds for cast alloy and carbide tool bits could be run at $100\ \mathrm{to}\ 150$ percent over the above listed rates.

DRILLING SPEEDS

	Types	Approx. Speed SFPM with H.S.S. Drills
The modified	430 F	60-100
free machining	420 F	60-90
grades	416	60-95
	440 F	50-70
	303	40-80
The unmodified	302	20-40
chromium-nickel	304	20-40
grades	310	20-40
	309	30-50
	316	30-50
	321	30-50
	347	30-50
The unmodified	403	35-75
straight chromium	410	35-75
grades	430	30-60
	440A, B & C	20-40
	442	30-60
	446	30-60

TAPPING SPEEDS

Grades	Suggested Speeds, SFM
430F and 416	15-35
303	15-30
Other grades	10-25

Sulfur base lubricants thinned with paraffin are regularly employed.



MACHINING OPERATIONS - CHASE STAINLESS STEEL

REAMING SPEEDS FOR DIMENSIONAL ACCURACY (SIZING)

	Type Number	Speed SFPM
The free machining	430 F	40-120
grades	420 F	40-110
8	416	40-100
	440 F	30-90
	303	25-90
The unmodified	302	20-70
chromium-nickel	304	20 - 70
grades	309	15-50
8	310	15-70
	316	20-70
	321	20-80
	347	20-80
The unmodified	403	25-70
straight chromium	410	25-70
grades	430	20-60
8	431	20-60
	440A, B, & C	15-60
	442	15-60
	446	15-60

Note: Carbide tipped tools may be operated at higher speeds, exact increases being best determined by test.

RAKE GRINDING TECHNIQUE FOR STAINLESS WITH TANGENT AND CIRCULAR CHASERS

Non-free machining grades of the straight chromium series with normal carbon such as Types 403, 410, 430, 431, 442 and 446. Also corresponding grades in the chromium-nickel series such as Types 302, 304, 309, 310, 316, 321 and 347	20-28° Rake
Non-free machining grades of the high carbon heat treatable straight chromium steels such as Types 420 and 440A, B and C.	15-20° Rake
The free machining grades of the chromium- nickel and straight chromium types.	10-20° Rake for tangent chasers and somewhat higher for circular chasers

Note: These ranges are approximate and subject to adjustment by skilled machine operators upon observing results.

MACHINING OPERATIONS - CHASE STAINLESS STEEL

HIGH SPEED STEEL MILLING CUTTER DESIGN FOR STAINLESS STEEL MILLING

			Peripheral		
		Axial Rake	Relief	Width of	0
Туре	Radial Rake		(Primary	Land	Special
of	((Helix or	Clear)	Cutter	Features
Tool	(Hook or	Shear	Cutter	Diameter,	to
1001	Undercut)	Angle)	Diameter,	Small	Consider
		0 ,	Small	Large	
			Large		
Plain Mill	10°	15°	8°	1/64"	Alternate chip
Slab Mill	20°	30°	6°	1/32''	breakers,
	30°	50°	3°	1/16"	notches
		70°			
	100	15°	100	.010''	
	10°		10°	.010	
End Mill	20°	30° 50°	5°	1/32''	
	30°	50°	5	1/32	
Face Mill	10°	10°	8°	1/32"	Chamfer or
Straddel	20°	20°	5°		radius or large
Mill	30°	30°	3°	1/16''	bevel angle
					Alternate high-
	0°	0°	8°	1/32"	narrow and
Saws	10°	0	5°	1,02	low-wide
Saws	20°	15°	3°	1/16"	teeth, alternate
	20	13	Ü	27 20	chamfer
Slotting	10-	0.0	0.0	1 (0011	Obtain harring
Cutters	10°	0°	8°	1/32''	Chip breakers,
Side Mills	20°	1.50	5°	1/1011	alternate
Stag. Side	30°	15°	3°	1/16''	chamfer with 0° axial rake
Mills					0 axiai i ake
Form	0°	0°	15°		Partial or
Relieved	10°		10°		staggered
Cutters	20°	10°	3°		teeth
Form					
Relieved	0°	0°	15°		Partial or
Thread	10°	O	10°		intermittent
Milling	20°	10°	3°		teeth
Cutters	20	10	3		
	00	0°	8°	1/32''	Intonmittont
Misc.	0°	U		1/32	Intermittent,
Profile	10°	1.50	5°	1 /1 011	alternate or
Cutters	20°	15°	3°	1/16"	staggered teeth

The bold figures show the ordinary range.

While the above rake angles are shown for high speed steel cutters, lower or more conservative rake angles are recommended for the cast cutting alloys and the cemeted carbides. Peripheral relief angle and width of land are approximately the same for all three tool materials.





MACHINING OPERATIONS - CHASE STAINLESS STEEL CUTTER TYPES AND PERMISSIBLE CHIP

	Chip/Tooth with
General Type	H.S.S. Cutter
Saw	.002" to .003"
Slotting Cutter	.003'' to .015''
End Mill	.001'' to .010''
Face Mill, Shell end mill	.007'' to .025''
Helical Mill	.004'' to .008''
Form Mill	.003'' to .008''

MILLING SPEEDS

Approximate milling speeds in surface feet per minute with high speed tools on typical grades in annealed wrought condition.

Types	Milling Speed Range (SFPM)
430 F	60-135 (and higher on light finish cuts)
416	60-130 (and higher on light finish cuts)
303	50-100
420 F	35-80
440 F	35-70
The unmodified	
chromium-nickel grades The unmodified	30-70
straight chromium grades	30-80 (less in the case of grades in hardened condition)

Note: With carbide tipped cutters, these speeds can be increased to extents that vary with other governing factors.



STAINLESS SHEET, STRIP & PLATE

A wide selection of types of Stainless Steel sheet, strip and plate is stocked by Chase Metals Service Centers in a wide range of sizes and finishes. Strip is stocked in coils and in cut lengths.

Types of Stainless other than those listed, as well as additional standard and special sizes can be supplied promptly from mill stocks. Adhesive paper coating and continuous line marking is available.

Notarized certification of the chemical analysis and physical properties of Stainless sheet, strip, or plate will be furnished when requested.





TYPE 302/304

X = Stock Sizes*

Thickness			Wei	ight			
	Decimal	Width,	Lbs. per	Lbs. per			
U.S.S.	Equivalent	Length	Sq. Ft.	Sheet		#3 Finish	#4 Finish
Gauge	Inches	Inches	(Approx.)	(Approx.)	#2B Finish	One Side	One Side
8	.1719	48 x 120	7.2187	288.9	X		
10	.1406	36 x 96	5.9062	141.9	X		X
10	.1406	36 x 120	5.9062	177.1	X		X
10	.1406	48 x 120	5.9062	236.5	X		X
10	.1406	60 x 120	5.9062	295.3	X		_
10	.1406	60 x 144	5.9062	354.4	X		-
11	.1250	36 x 96	5.2500	126.1	X	X	X
11	.1250	36 x 120	5.2500	157.5	X	X	X
11	.1250	48 x 96	5.2500	168.3	X	X	_
11	.1250	48 x 120	5.2500	210.3	X	X	X
11	.1250	60 x 120	5.2500	262.5	X		
11	.1250	60 x 144	5,2500	315.0	X		
11	.1250	72 x 144	5.2500	378.0	X		
12	.1094	30 x 120	4.5937	114.9	X		-
12	.1094	36 x 96	4.5937	110.3	X	X	X
12	.1094	36 x 120	4,5937	137.8	X	X	X
12	.1094	48 x 96	4.5937	147.1	X		
12	.1094	48 x 120	4.5937	183.8	X	X	X
12	.1094	48 x 144	4,5937	220.6	X		
12	.1094	60 x 120	4.5937	229.7	X	X	
12	.1094	60 x 144	4.5937	275.6	x		-
13	.0938	36 x 120	3.9375	118.1	x		X
13	.0938	48 x 96	3.9375	126.1	X		
13	.0938	48 x 120	3.9375	157.6	X	_	-
14	.0781	30 x 120	3.2812	82.1	X	X	X
14	.0781	36 x 96	3,2812	78.8	X	X	X
14	.0781	36 x 120	3.2812	98.5	X	X	X
14	.0781	36 x 144	3.2812	118.2	X		-
14	.0781	42 x 120	3.2812	114.9	X	_	_
14	.0781	48 x 96	3.2812	105.1	X	x	
14	.0781	48 x 120	3.2812	131.4	X	x	X
14	.0781	48 x 144	3.2812	157.6	X	_	_
14	.0781	60 x 120	3.2812	164.1	X	x	x
14	.0781	60 x 144	3.2812	196.9	X		-
16	.0625	30 x 96	2,6250	52.6	х	_	-
16	.0625	30 x 120	2.6250	65.7	X	X	X
16	.0625	36 x 96	2.6250	63.0	X	x	X
16	.0625	36 x 120	2.6250	78.7	X	X	X
16	.0625	36 x 144	2.6250	94.6	X	_	
16	.0625	42 x 120	2.6250	92.0	X		_
	.0625	42 x 120 48 x 72	2.6250	63.0	X		
16				84.1	X	x	X
16	.0625	48 x 96	2.6250		X	X	X
16	.0625	48 x 120	2.6250	105.1	X	_	X
16	.0625	48 x 144	2.6250	126.1	<u> </u>		X
16	.0625	54 x 120	2.6250	118.1		X	X
16	.0625	60 x 120	2.6250	131.3	X		
16	.0625	60 x 144	2.6250	157.5	X		

Continued

 $^{{}^*}$ Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.

USTALS SEAD

TYPE 302/304

X = Stock Sizes*

Continued

Thickness			Weight				
	Decimal	Width,	Lbs. per	Lbs. per			
J.S.S.	Equivalent	Length	Sq. Ft.	Sheet		#3 Finish	#4 Finish
Gauge	Inches	Inches	(Approx.)	(Approx.)	#2B Finish	One Side	One Side
18	.0500	24 x 96	2.1000	33.6	X		
18	.0500	30 x 96	2.1000	42.0	X	X	X
18	.0500	30 x 120	2.1000	52.6	X	X	X
18	.0500	36 x 96	2.1000	50.5	X	X	X
18	.0500	36 x 120	2.1000	63.0	X	X	X
18	.0500	48 x 96	2.1000	67.3	X	X	X
18	.0500	48 x 120	2.1000	84.1	X	X	X
18	.0500	48 x 144	2.1000	100.9	X		_
18	.0500	54 x 120	2.1000	94.5	_		x
18	.0500	60 x 120	2.1000	105.0	_	X	_
19	.0438	30 x 120	1.8375	45.9	x		_
19	.0438	36 x 120	1.8375	55.1	X	_	_
20	.0375	24 x 120	1.5750	31.5	_	X	_
20	.0375	30 x 96	1.5750	31.5	X	X	X
20	.0375	30 x 120	1.5750	39.4	X	-	X
20	.0375	36 x 96	1.5750	37.8	X	X	X
20	.0375	36 x 120	1.5750	47.3	X	X	x
20	.0375	48 x 96	1.5750	50.5	X	X	X
20	.0375	48 x 120	1.5750	63.1	X	X	x
20	.0375	48 x 144	1.5750	75.7	X	_	_
22	.0313	30 x 96	1.3125	26.2	x	_	X
22	.0313	30 x 120	1.3125	32.8	X	X	X
22	.0313	36 x 96	1.3125	31.5	X	X	X
22	.0313	36 x 120	1.3125	39.3	X	X	X
22	.0313	48 x 96	1.3125	41.9	X	_	X
22	.0313	48 x 120	1.3125	52.5	X	X	x
22	.0313	48 x 144	1.3125	62.9	X	_	_
24	.0250	24 x 96	1.0500	16.8	х	_	_
24	.0250	24 x 120	1.0500	21.0		_	X
24	.0250	30 x 96	1.0500	21.0	x	-	X
24	.0250	30 x 120	1.0500	26.3	X	_	X
24	.0250	36 x 96	1.0500	25.2	x	X	X
		36 x 120	1.0500	31.5	X	x	x
24	.0250	48 x 96	1.0500	33.7	x	X	X
24 24	.0250 .0250	48 x 120	1.0500	42.1	X	X	X
26	.0188	30 x 96	.7875	15.7	х	_	X
26	.0188	30 x 120	.7875	19.7	X	_	X
26	.0188	36 x 96	.7875	18.8	x	X	x
26	.0188	36 x 120	.7875	23.6	X	X	x
26	.0188	48 x 120	.7875	31.5	X	X	X
26	.0188	48 x 144	.7875	37.7	X	_	_
28	.0156	36 x 96	.6562	15.7	x	X	X
28	.0156	36 x 120	.6562	19.7	x	X	X
28	.0156	48 x 120	.6562	26.2	_	X	_
30	.0125	36 x 96	.5250	12.6	x		X

^{*}Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.



TYPE 304 ELC

X = Stock Sizes*

	Thickness		Weight					
1	U.S.S.	Decimal Equivalent	Width, Length	Lbs. per Sq. Ft.	Lbs. per Sheet	#2B Finish	#3 Finish One Side	#4 Finish One Side
	Gauge	Inches	Inches	(Approx.)	(Approx.)		One blue	One blue
	8	.1719	48 x 120	7.2187	288.9	X	_	
	10	.1406	48 x 120	5.9062	236.5	X	-	
	11	.1250	48 x 120	5.2500	210.3	X		_
	12	.1094	48 x 120	4.5937	183.8	X	_	_
	14	.0781	48 x 120	3.2812	131.4	X		_
	16	.0625	48 x 120	2.6250	105.1	X	_	
				TYS	PE 310			
						#2D Finish		
	13	.0938	36 x 120	3.9375	118.1	X		-
	18	.0500	36 x 96	2.1000	50.5	x	_	_
	22	.0313	36 x 96	1.3125	31.5	X	_	
					PE 316			
				• • • • • • • • • • • • • • • • • • • •	L 310	#2B Finish		
	10	.1406	36 x 120	5.9062	177.1	x	_	_
	10	.1406	48 x 120	5.9062	236.5	X	_	_
	10	.1406	60 x 144	5.9062	354.4	X	_	-
	11	.1250	36 x 96	5.2500	126.1	X		_
	11	.1250	36 x 120	5.2500	157.5	X		
	11	.1250	48 x 120	5.2500	210.3	X	X	
	11	.1250	60 x 120	5.2500	262.5	X		-
	11	.1250	60 x 144	5.2500	315.0	X	_	_
	11	.1250	72 x 120	5.2500	315.0	X	_	_
	11	.1250	72 x 144	5.2500	378.0	X	_	
	12	.1094	36 x 96	4.5937	110.3	_	X	-
	12	.1094	36 x 120	4.5937	137.8	X	X	
	12	.1094	48 x 96	4.5937	147.1	X		
	12	.1094	48 x 120	4.5937	183.8	X	_	_
	12	.1094	48 x 144	4.5937	220.6	X	-	-
	12	.1094	60 x 120	4.5937	229.7	X	_	_
	12	.1094	60 x 144	4.5937	275.6	X		_
	14	.0781	30 x 120	3.2812	82.1	X		_
	14	.0781	36 x 96	3.2812	78.8	X	X	_
	14	.0781	36 x 120	3.2812	98.5	X	X	-
	14	.0781	48 x 120	3.2812	131.4	X	X	_
	16	.0625	36 x 96	2.6250	63.0	X	X	_
	16	.0625	36 x 120	2.6250	78.7	X	X	-
	16	.0625	48 x 96	2.6250	84.1	X	X	_
	16	.0625	48 x 120	2.6250	105.1	X	X	-
	18	.0500	36 x 96	2.1000	50.5	X	X	-
	18	.0500	36 x 120	2.1000	63.0	X	X	X
	18	.0500	48 x 120	2.1000	84.1	X	X	_

Continued

^{*}Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.



STAINLESS SHEET

TYPE 316

X = Stock Sizes*
Continued

Thickness			We	ight	
	Decimal	Width,	Lbs. per	Lbs. per	
J.S.S.	Equivalent	Length	Sq. Ft.	Sheet	
auge	Inches	Inches	(Approx.)	(Approx.)	#2B Finish
20	.0375	30 x 120	1.5750	39.4	X
20	.0375	36 x 96	1.5750	37.8	X
20	.0375	36 x 120	1.5750	47.3	X
20	.0375	48 x 120	1.5750	63.1	X
22	.0313	36 x 96	1.3125	31.5	X
22	.0313	36 x 120	1.3125	39.3	X
22	.0313	48 x 120	1.3125	52.5	X
24	.0250	30 x 96	1.0500	21.0	X
24	.0250	30 x 120	1.0500	26.3	X
24	.0250	36 x 96	1.0500	25.2	X
24	.0250	36 x 120	1.0500	31.5	X
24	.0250	48 x 96	1.0500	33.7	X
24	.0250	48 x 120	1.0500	42.1	X
26	.0188	36 x 96	.7875	18.8	X
26	.0188	36 x 120	.7875	23.6	X
26	.0188	48 x 120	.7875	31.5	X
28	.0156	36 x 96	.6562	15.7	X
28	.0156	36 x 120	.6562	19.7	X
28	.0156	48 x 120	.6562	26.2	X
		TYPE	316 ELC		
10	.1406	48 x 120	5.9062	236.5	X
12	.1094	48 x 120	4.5937	183.8	X
14	.0781	48 x 120	3.2812	131.4	X
16	.0625	36 x 96	2.6250	63.0	X
16	.0625	48 x 120	2.6250	105.1	X
		TY	(PE 321		#2D Finish
10	.1406	48 x 120	5.9062	236.5	X
11	.1250	36 x 120	5.250	157.5	X
12	.1094	48 x 120	4.5937	183.8	X
14	.0781	48 x 120	3.2812	131.4	x
16	.0625	36 x 120	2.6250	78.7	X
16	.0625	48 x 120	2.6250	105.1	X
18	.0500	36 x 120	2,1000	63.0	X
19	.0438	29 x 68	1.8375	25.2	x
20	.0375	36 x 96	1.5750	37.8	х
20	.0375	36 x 120	1.5750	47.3	X
22	.0313	36 x 120	1.3125	39.3	х
22	.0313	48 x 80	1.3125	35.0	x
22	.0313	48 x 144	1.3125	62.9	X
23	.0281	36 x 120	1.1813	35.4	X
24	.0250	36 x 96	1.0500	25.2	x
24	.0250	36 x 120	1.0500	31.5	X
26	.0188	36 x 120	.7875	23.6	х
28		36 x 96	.6562	15.7	X
48	.0156	30 X 90	.0002	10.1	Λ

^{*}Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.



TYPE 347

X = Stock Sizes*

Thi	ickness		We	ight				
	Decimal	Width,	Lbs. per	Lbs. per				
U.S.S.	Equivalent	Length	Sq. Ft.	Sheet	#2D			
Gauge	Inches	Inches	(Approx.)	(Approx.)	Finish			
16	.0625	36 x 96	2.6250	63.0	X			
18	.0500	36 x 96	2.1000	50.5	X			
19	.0438	36 x 96	1.8375	44.1	X			
20	.0375	36 x 96	1.5750	37.8	X			
22	.0313	36 x 96	1.3125	31.5	X			
24	.0250	36 x 96	1.0500	25.2	X			
25	.0219	36 x 96	.9187	22.0	X			
			TY	PE 410				
11	.1250	36 x 120	5.1500	154.5	X			
16	.0625	48 x 120	2.5750	103.0	X			
18	.0500	48 x 120	2.0600	82.4	X			
			TY	PE 430				
			• • • • • • • • • • • • • • • • • • • •		#2B	#3	#4	Bright
					Finish			Automobile
					Moulding Quality	1 Side	1 Side	Finish
11	.1250	36 x 96	5.1500	123.6	X	_	_	-
11	.1250	36 x 120	5.1500	154.5	X		_	-
14	.0781	32 x 96	3.2187	68.7	X	_	-	_ x
14 14	.0781 .0781	36 x 96 36 x 120	3.2187 3.2187	77.2 96.5	x _	_		X
14	.0781	48 x 120	3.2187	128.7	X	_	_	_
16	.0625	36 x 96	2,5750	61.8	x	_	_	
16	.0625	36 x 120	2.5750	77.2	X			_
16	.0625	48 x 120	2.5750	103.0	X	umm.	_	_
18	.0500	36 x 96	2.0600	49.4	X	_	_	X
18	.0500	36 x 120	2.0600	61.8	X	_	-	X
18	.0500	48 x 120	2.0600	82.4	X	_	_	_
20	.0375	36 x 96	1.5450	37.0	X	-	X	-
20	.0375	36 x 120	1.5450	46.3	X X	_	_	X
20	.0375	48 x 120	1.5450	61.8		-		-
22 22	.0313	36 x 96 36 x 120	1.2875 1.2875	30.9 38.6	X X	x -	X X	X X
	.0313							
24 24	.0250 .0250	20 x 120 30 x 120	1.0300 1.0300	17.2 25.8	×	_	X _	_
24	.0250	36 x 96	1.0300	24.7	X			x
24	.0250	36 x 120	1.0300	30.9	X	-	X	X
26	.0188	30 x 96	.7725	15.4	x	_	_	_
26	.0188	36 x 96	.7725	18.5	X	_	_	_
26	.0188	36 x 120	.7725	23.1	X	-	_	-
28	.0156	36 x 96	.6438	15.4	X	-	_	_
30	.0125	36 x 96	.5150	12.3	X	-		_

 $^{{}^*}$ Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.



STAINLESS STRIP

IN COILS

Type	Thickness Inches	Width Inches	Finish	Weight Lbs. per Sq. Ft. (Approx.)
301	.025	6 3/8	# 2	1.0500
301	.020	3		.8400
301	.020	6	_	.8400
301	.020	9	_	.8400
301	.020	12		.8400
301	.016	1 3/8	Half Hard	.6720
302	.065	3.200	2B	2.7300
302	.062	1.540	2B	2.6040
302	.0375	24 1/2	2B	1.5750
302	.032	7	Bright 2B	1.3440
302	.0313	24 1/2	2B	1.2875
302	.026	2 11/16	Quarter-Hard	1.0920
302	.025	6	Bright 2B	1.0300
302	.023	.325	2B	.9660
302	.020	2	Quarter-Hard	.8400
302	.020	6	Bright 2B	.8400
302	.018	5/8	2B	.7560
302	.016	1 11/16	Quarter-Hard	.6720
302	.012	1 1/4	Quarter-Hard	.5040
304	.020	2 5/8	#1 Dull	.8400
304	.020	Cutting	#1 Dull	.8400
403	.012	Cutting	#2 Bright	.4944
430	.078	3 5/8	2B	3.2136
430	.0371	18	2B	1.5285
430	.031	9/16	2B	1.2772
430	.030	4 7/8	#1	1.2360
430	.025	1 1/2	#2 Anneal	1.0300
430	.025	2 1/4	#2 Anneal	1.0300
430	.025	2 7/8	#2 Anneal	1.0300
430	.025	8	2B	1.0300
430	.025	18	#2 Bright Automotive	1.0300
430	.020	8 3/4	#2 Bright Anneal	.8240
430	.017	3 3/4	#4 Soft	.7004
430	.015	1 61/64	# 2	.6180

CUT LENGTHS

Type	Thickness Inches	Width Inches	Length Inches	Finish	Weight Lbs. per Sq. Ft. (Approx.)
301	.025	2 9/16	96	#2F	1.0500
301	.012	22	96	#2	.5040
321	.109	3 5/8	65 3/4	#2D	4.5780
321	.106	7 3/16	70 3/4	# 2D	4.4520
321	.070	5 3/4	73 1/4	# 2D	2.9400
321	.067	8	64	#2D	2.8140
321	.056/.068	5 1/4	72	#2D	2.6040
321	.030/.035	8 5/8	72	#2D	1.3650
430	.125	2	90	#2B	5.1500

^{*}Other gauges, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.





STAINLESS PLATE

				We	ight
Type	Thickness Inches	Size Inches	Finish	Lbs. per Sq. Ft.	Lbs. per Plate
202 202	3/16 1/4	48 x 120 48 x 120	H.R.A.P. H.R.A.P.	7.9850 10.6460	319.4 425.8
304	3/16	48 x 120	#1	7.9850	319.4
310	3/16	48 x 96	Hot Rolled	7.9850	255.5
316	3/16	60 x 120	#1	7.9850	399.3
410	3/16	36 x 120	# 2D	7.8253	234.8

Other types and finishes as well as other standard and special sizes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.



CHASE STAINLESS Material Certification

Notarized certification of the chemical analysis and physical properties of any stainless steel material supplied by Chase Metals Service Division will be furnished when requested.



CHASE STAINLESS STEEL

STANDARD TOLERANCES - SHEETS

STANDARD GAUGE TOLERANCES - ALL FINISHES

Thickness Inches	Gage	Tolerance Plus or Minus Inches						
Under incl	No.	48 Max. Width	Widths Over 48					
.1875 to .146	8 & 9	.007	.014					
.146 to .131	10	.006	.012					
.131 to .115	11	.005	.010					
.115 to .099	12	.005	.009					
.009 to .084	13	.004	.008					
.084 to .073	14	.004	.007					
.073 to .059	15 & 16	.003	.006					
.059 to .041	17 to 19	.003	.005					
.041 to .030	20 to 22	.002	.004					
.030 to .017	23 to 27	.0015	.003					
.017 to .008	28 to 34	.0015	.002					
.008 to .006	35 to 38	.0015	.0015					
.006 to	39	.001	.001					

SIZE TOLERANCES (Stretcher Leveled and Resquared Material)

* WIDTH

Nothing under size specified	1/16'	' over, widths up to 48" incl
Nothing under size specified		1/8" over, widths over 48"

*LENGTH

Nothing under size specified	1/16" ove	r, lengths up to 120" incl
Nothing under size specified		over, lengths over 120"

^{*131} inch and heavier, regardless of size, may have 1/8 inch plus in width and length.

FLATNESS TOLERANCES (Stretcher Leveled Material)

Sheets specified to stretcher leveled standard of flatness (exclusive of hard tempers of 200 and 300 series grades).

Thickness Width Inches Inches		Length Inches	Flatness Tolerance (maximum deviation from a horizontal flat surface), Inches				
Under 3/16	To 48 incl	To 96 incl	1/8				
Under 3/16	To 48 incl	Over 96	1/4				
Under 3/16	Over 48	To 96 incl	1/4				
Under 3/16	Over 48	Over 96	1/4				

CHASE STAINLESS STEEL

STANDARD TOLERANCES - COLD ROLLED STRIP

THICKNESS TOLERANCES

Annealed Temper Only - 200, 300 and 400 Series Grades

Measured 3/8 inch in from edge on 1 inch or wider; and on narrower than 1 inch at any place on the strip.

This laws are			Width	-Inches		
Thickness				Over 6		
Inches	Under 1	Under 3	3 to 6	to 12	Over 12	Over 16
under incl	to 3/16	to 1	incl	incl	to 16	to 23 15/16
under mer	+ & -	+ & -	+ & -	+ & -	+ & -	+ & -
.1875 to .161	.002	.003	.004	.004	.005	.006
.161 to .100	.002	.002	.003	.004	.004	.005
.100 to .069	.002	.002	.003	.003	.004	.004
.069 to .050	.002	.002	.003	.003	.003	.003
.050 to .040	.002	.002	.0025	.003	.003	.003
.040 to .035	.002	.002	.002	.002	.002	.002
.035 to .029	.0015	.0015	.002	.002	.002	.002
.029 to .026	.001	.0015	.0015	.0015	.0015	.0015
.026 to .020	.001	.001	.0015	.0015	.0015	.0015
.020 to .013	.001	.001	.001	.0015	.0015	.0015
.013 to .011	.001	.001	.001	.001	.0015	.0015
.011 to .010	.001	.001	.001	.001	.001	.0015
.010 to .006	.00075	.00075	.00075	_	_	_
.006	.0005	.0005	.0005	_	_	_

THICKNESS TOLERANCES

Applicable when Rockwell C-25 Minimum is Specified or Required for 400 Series Grades or when 1/4 through Full Hard is Specified or Required for 200 and 300 Series Grades.

Measured 3/8 inch in from edge on 1 inch or wider; and on narrower than 1 inch at any place on the strip.

mi : -1			Width	-Inches		
Thickness				Over 6		
Inches	Under 1	Under 3	3 to 6	to 12	Over 12	Over 16
	to 3/16	to 1	incl	incl	to 16	to 23 15/16
under incl	+ & -	+ & -	+ & -	+ & -	+ & -	+ & -
.1875 to .161	.002	.003	.004	.004	.005	.006
.161 to .100	.002	.002	.003	.004	.004	.005
.100 to .069	.002	.002	.003	.003	.004	.004
.069 to .050	.002	.002	.003	.003	.003	.004
.050 to .040	.002	.002	.0025	.003	.003	.004
.040 to .035	.002	.002	.0025	.003	.003	.003
.035 to .029	.0015	.0015	.002	.0025	.0025	.003
.029 to .026	.001	.0015	.0015	.002	.002	.003
.026 to .020	.001	.001	.0015	.002	.002	.0025
.020 to .013	.001	.001	.001	.0015	.002	.002
.013 to .011	.001	.001	.001	.001	.0015	.0015
.011 to .010	.001	.001	.001	.001	.001	.0015
.010 to .006	.00075	.00075	.00075		_	_
.006	.0005	.0005	.0005	_	_	_

CROWN TOLERANCES

Cold rolled strip may be thicker at the middle than at the edges by the following amounts:

Thickness	Additional thickness at middle of strip over that									
T Mennegs	provided for widths and thicknesses given									
Inches	To 5" incl	Over 5 to 12'' incl	Over 12 to 24'' excl							
.005 to .010 incl	.00075	.001	.0015							
Over .010 to .025 incl	.001	.0015	.0015							
Over .025 to .065 incl	.0015	.002	.002							
Over .065 to 3/16 excl	.002	.0025	.003							

Note: Above Crown Tolerances to be considered as additions to Thickness Tolerances.



CHASE STAINLESS STEEL

STANDARD TOLERANCES - COLD ROLLED STRIP

CAMBER TOLERANCES

Up to and including 1 1/2" wide	1/2" in any 8' length
Over 1 1/2" to 24" wide excl	

Camber to be determined by placing an 8 foot straight edge against the concave side of the strip.

WIDTH TOLERANCES

NO. 3 EDGE

	Width-Inches												
Thickness Inches under incl	Under 1/2 to 3/16 incl + & -	1/2 to 6 incl + & -	Over 6 to 9 incl + & -	Over 9 to 12 incl + & -	Over 12 to 20 incl + & -	Over 20 to 23 15/16 incl + & -							
.1875 to .161	.010 .008 .005	.016 .010 .008 .005	.020 .016 .010 .005	.020 .016 .010 .010	.031 .020 .016 .016	.031 .020 .020 .020							

NOS, 1 AND 5 EDGES

Edge	Width—Inches	Thickness-Inches	Tolerance Inches + & -
1	5 or narrower	under .1875	.005
5	5 or narrower	under .1875	.005
5	Over 5 to 20 incl	under .1875	.010
5	Over 20 to 23 15-16 incl	under .1875	.015

LENGTH TOLERANCES

	h of Strip Feet					al		-	-	rance—Inches r, nothing under
Up to	5 incl	 								3/8
over	incl									
5 to	10	 								1/2
10 to	20	 	 							5/8
20 to	30	 	 							3/4
30 to	40	 	 							1
40 to	60	 	 							1 1/2
60 to	90	 	 							2
90 to	200		 							2 1/2



WEIGHT TABLES CHASE STAINLESS STEEL STRIP

Weight per Lineal Foot in Pounds
CR-NI-MN AND CHROMIUM-NICKEL TYPES*

Thie	ckness	Width-Inches								
B.W.G. Number	Decimal Equiva- lent	1/16	1/8	3/16	1/4	5/16	3/8	7/16	1/2	9/16
For Inter- pola- tion	.001''	.0002	.0004	.0006	.0009	.0010	.0013	.0015	.0018	.0019
7	.180''	.0394	.0788	.1182	.1575	.1969	.2363	.2757	.3150	.3544
8	.165''	.0361	.0722	.1083	.1444	.1805	.2166	.2527	.2887	.324
9	.148''	.0324	.0648	.0972	.1295	.1620	.1943	.2268	.2590	.291
10	.134''	.0293	.0587	.0880	.1173	.1466	.1760	.2052	.2345	.263
11	.120"	.0263	.0525	.0788	.1050	.1313	.1575	.1838	.2100	.236
12	.109''	.0239	.0477	.0716	.0954	.1193	.1431	.1670	.1908	.214
13	.095''	.0208	.0416	.0624	.0831	.1040	.1247	.1455	.1663	.187
14	.083''	.0182	.0363	.0545	.0726	.0908	.1089	.1271	.1453	.163
15	.072''	.0158	.0315	.0473	.0630	.0788	.0945	.1103	.1260	.141
16	.065''	.0142	.0285	.0427	.0569	.0712	.0854	.0997	.1138	.128
17	.058''	.0127	.0254	.0381	.0508	.0635	.0762	.0889	.1015	.114
18	.049''	.0107	.0214	.0321	.0429	.0535	.0643	.0749	.0858	.096
19	.042''	.0092	.0184	.0276	.0368	.0460	.0552	.0644	.0735	.082
20	.035''	.0077	.0153	.0230	.0306	.0383	.0459	.0536	.0613	.068
21	.032''	.0070	.0140	.0210	.0280	.0350	.0420	.0490	.0560	.063
22	.028''	.0061	.0123	.0184	.0245	.0307	.0368	.0430	.0490	.055
23	.025''	.0055	.0110	.0165	.0219	.0275	.0329	.0385	.0438	.049
24	.022''	.0048	.0096	.0144	.0193	.0240	.0289	.0336	.0385	.043
25	.020''	.0044	.0088	.0132	.0175	.0220	.0263	.0307	.0350	.039
26	.018''	.0039	.0079	.0118	.0158	.0197	.0237	.0276	.0315	.035
27	.016''	.0035	.0070	.0105	.0140	.0175	.0210	.0245	.0280	.031
28	.014''	.0030	.0061	.0091	.0123	.0152	.0184	.0213	.0245	.027
29	.013''	.0028	.0057	.0085	.0114	.0142	.0171	.0199	.0228	.025
30	.012''	.0026	.0053	.0079	.0105	.0132	.0158	.0185	.0210	.023
31	.010''	.0022	.0044	.0066	.0088	.0110	.0132	.0154	.0175	.019
32	.009''	.0020	.0040	.0060	.0079	.0100	.0119	.0140	.0158	.0180
33	.008''	.0018	.0035	.0053	.0070	.0088	.0105	.0123	.0140	.015
34	.007''	.0015	.0031	.0046	.0062	.0077	.0093	.0108	.0123	.0139
35	.005"	.0011	.0022	.0033	.0044	.0055	.0066	.0077	.0088	.0099
36	.004"	.0009	.0018	.0027	.0035	.0045	.0053	.0063	.0070	.0080

^{*}For straight chromium types deduct 1.7%.



WEIGHT TABLES CHASE STAINLESS STEEL STRIP

Weight per Lineal Foot in Pounds
CR-NI-MN AND CHROMIUN-NICKEL TYPES*

Thic	kness				Wi	dth-Inc	hes			
B.W.G. Number	Decimal Equiva- lent	5/8	11/16	3/4	13/16	7/8	15/16	1	2	3
For Inter- pola- tion	.001''	.0022	.0023	.0027	.0028	.0030	.0032	.0035	.0070	.0105
7	.180''	.3938	.4332	.4725	.5119	.5513	.5907	.6300	1.260	1.890
8	.165''	.3610	.3971	.4331	.4693	.5054	.5415	.5775	1.155	1.733
9	.148''	.3238	.3562	.3885	.4209	.4533	.4857	.5180	1.036	1.554
10	.134''	.2933	.3225	.3518	.3811	.4106	.4398	.4690	0.938	1.407
11	.120''	.2625	.2888	.3150	.3413	.3675	.3938	.4200	0.840	1.260
12	.109''	.2385	.2624	.2862	.3101	.3339	.3578	.3815	0.763	1.145
13	.095''	.2078	.2287	.2494	.2703	.2910	.3118	.3325	0.665	0.998
14	.083''	.1815	.1998	.2179	.2361	.2542	.2724	.2905	0.581	0.872
15	.072''	.1575	.1733	.1890	.2048	.2205	.2363	.2520	0.504	0.756
16	.065''	.1423	.1566	.1707	.1850	.1992	.2135	.2275	0.455	0.683
17	.058''	.1270	.1397	.1523	.1650	.1777	.1904	.2030	0.406	0.609
18	.049''	.1072	.1179	.1287	.1393	.1501	.1607	.1715	0.343	0.515
19	.042''	.0920	.1012	.1103	.1196	.1288	.1379	.1470	0.294	0.441
20	.035''	.0765	.0842	.0919	.0995	.1071	.1148	.1225	0.245	0.368
21	.032''	.0700	.0770	.0840	.0910	.0980	.1050	.1120	0.224	0.336
22	.028''	.0613	.0675	.0735	.0797	.0858	.0920	.0980	0.196	0.294
23	.025''	.0548	.0604	.0657	.0713	.0767	.0822	.0875	0.175	0.263
24	.022''	.0481	.0529	.0578	.0625	.0674	.0722	.0770	.1540	.2310
25	.020''	.0438	.0482	.0525	.0570	.0613	.0657	.0700	.1400	.2100
26	.018''	.0395	.0434	.0473	.0513	.0553	.0592	.0630	.1260	.1890
27	.016''	.0350	.0385	.0420	.0455	.0490	.0525	.0560	.1120	.1680
28	.014''	.0306	.0336	.0368	.0397	.0429	.0459	.0490	.0980	.1470
29	.013''	.0285	.0313	.0342	.0370	.0398	.0427	.0455	.0910	.136
30	.012''	.0264	.0291	.0315	.0343	.0369	.0396	.0420	.0840	.1260
31	.010''	.0219	.0242	.0263	.0286	.0308	.0330	.0350	.0700	.1050
32	.009"	.0198	.0220	.0237	.0260	.0277	.0297	.0315	.0630	.094
33	.008''	.0175	.0193	.0210	.0228	.0246	.0263	.0280	.0560	.0840
34	.007''	.0154	.0170	.0185	.0201	.0215	.0231	.0245	.0490	.073
35	.005''	.0110	.0121	.0132	.0143	.0154	.0165	.0175	.0350	.052
36	.004''	.0088	.0098	.0105	.0115	.0123	.0132	.0140	.0280	.0420

^{*}For straight chromium types deduct 1.7%.



WEIGHT TABLES CHASE STAINLESS STEEL STRIP

Weight per Lineal Foot in Pounds

CR-NI-MN AND CHROMIUM-NICKEL TYPES*

Thic	kness	Width-Inches								
B.W.G. Number	Decimal Equiva- lent	4	5	6	7	8	9	10	11	12
For Inter- pola- tion	.001''	.0140	.0175	.0210	.0245	.0280	.0315	.0350	.0385	0.04
7	.180''	2.520	3.150	3.780	4.410	5.040	5.670	6.300	6.930	7.56
8	.165''	2.310	2.888	3.465	4.043	4.620	5.198	5.775	6.353	6.93
9	.148''	2.072	2.590	3.108	3.626	4.144	4.662	5.180	5.698	6.21
10	.134''	1.876	2,345	2.814	3.283	3.752	4.221	4.690	5.159	5.62
11	.120''	1.680	2.100	2.520	2.940	3.360	3.780	4.200	4.620	5.04
12	.109''	1.526	1.908	2.289	2.671	3.052	3.434	3.815	4.197	4.57
13	.095''	1.330	1.663	1.995	2.328	2,660	2.993	3.325	3.658	3.99
14	.083''	1.162	1.453	1.743	2.034	2.324	2.615	2.905	3.196	3.48
15	.072''	1.008	1.260	1.512	1.764	2.016	2.268	2.520	2.772	3.02
16	.065''	0.910	1.138	1.365	1.593	1.820	2,048	2,275	2.503	2.73
17	.058''	0.812	1.015	1.218	1.421	1.624	1.827	2.030	2.233	2.43
18	.049''	0.686	0.858	1.029	1.201	1.372	1.544	1.715	1.887	2.05
19	.042''	0.588	0.735	0.882	1.029	1.176	1.323	1.470	1.617	1.76
20	.035''	0.490	0.613	0.735	0.858	0.980	1.103	1.225	1.348	1.47
21	.032''	0.448	0.560	0.672	0.784	0.896	1.008	1.120	1.232	1.34
22	.028''	0.392	0.490	0.588	0.686	0.784	0.882	0.980	1.078	1.17
23	.025''	0.350	0.438	0.525	0.613	0.700	0.788	0.875	0.963	1.05
24	.022''	.3080	.3850	.4620	.5390	.6160	.6930	.7700	.8470	0.92
25	.020''	.2800	.3500	.4200	.4900	.5600	.6300	.7000	.7700	0.84
26	.018''	.2520	.3150	.3780	.4410	.5040	.5670	.6300	.6930	0.75
27	.016''	.2240	.2800	.3360	.3920	.4480	.5040	.5600	.6160	0.67
28	.014''	.1960	.2450	.2940	.3430	.3920	.4410	.4900	.5390	0.58
29	.013''	.1820	.2275	.2730	.3185	.3640	.4095	.4550	.5005	0.54
30	.012''	.1680	.2100	.2520	.2940	.3360	.3780	.4200	.4620	0.50
31	.010''	.1400	.1750	.2100	.2450	.2800	.3150	.3500	.3850	0.42
32	.009''	.1260	.1575	.1890	.2205	.2520	.2835	.3150	.3465	0.37
33	.008''	.1120	.1400	.1680	.1960	.2240	.2520	.2800	.3080	0.33
34	.007''	.0980	.1225	.1470	.1715	.1960	.2205	.2450	.2695	0.29
35	.005"	.0700	.0875	.1050	.1225	.1400	.1575	.1750	.1925	0.21
36	.004"	.0560	.0700	.0840	.0980	.1120	.1260	.1400	.1540	0.16

^{*}For straight chromium types deduct 1.7%.



Make your first thought

for

STAINLESS STEEL

Tubing and Pipe



STAINLESS TUBING AND PIPE

SENER STRINGERS

In the relatively few years that stainless tubing and pipe have been produced in this country, their recognized importance in industrial applications has resulted in a steadily increasing demand. Stainless steel's resistance to somany different types of corrosive attacks and its ability to withstand high temperatures and high pressures make it first choice for many uses. Stainless steel

tubing and pipe are available in a choice of alloys and finishes covering a range of properties.

In addition to seamless and welded tubing from 1/8-inch to 4-1/2'' O.D. and seamless and welded pipe from 1/8-inch to 8-inch Iron Pipe Size, Chase Metals Service also stocks ornamental tubing (round and square) and welded beverage tubing. In addition to the varied stock types and sizes, we can promptly supply many others from mill stocks available to us.



STAINLESS TUBING

SEAMLESS AND WELDED

COLD DRAWN, ANNEALED AND PICKLED

Types 304-316-321

In Standard Mill Lengths

	Wall	Thickness		Weight
	Inches	Decimal	Inside	Lbs. per
O.D.	and	Equivalent	Diameter	Lin. Ft.
Inches	Gauge	Inches	Inches	(Approx.)
1/8	22	.028	.069	.0290
3/16	22	.028	.131	.0478
3/16	20	.035	.117	.0572
1/4	22	.028	.194	.0664
1/4	20	.035	.180	.0804
1/4	18	.049	.152	.1052
1/4	16	.065	.120	.1284
5/16	18	.049	.214	.1382
5/16	16	.065	.182	.1722
3/8	22	.028	.319	.1038
3/8	20	.035	.305	.1271
3/8	18	.049	.277	.1706
3/8	16	.065	.245	.2152
1/2	20	.035	.430	.1738
1/2	18	.049	.402	.2360
1/2	16	.065	.370	.3020
1/2	13	.095	.310	.4109
1/2	11	.120	.260	.4870
5/8	20	.035	.555	.2205
5/8	18	.049	.527	.3014
5/8	16	.065	.495	.3888
5/8	11	.120	.385	.6472
3/4	20	.035	.680	.2673
3/4	18	.049	.652	.3668
3/4	16	.065	.620	.4755
3/4	13	.095	.560	.6646
3/4	11	.120	.510	.8074
7/8	18	.049	.777	.4323
7/8	16	.065	.745	.5623
7/8	11	.120	.635	.9676
1	20	.035	.930	.3607
1	18	.049	.902	.4977
1	16	.065	.870	.6491
1	14	.083	.834	.8129
1	13	.095	.810	.9182
1	11	.120	.760	1.128
1	3/16	.188	.625	1.630
1	1/4	.250	.500	2.003
1 1/4	16	.065	1.120	.8226
1 1/4	14	.083	1.084	1.034
1 1/4	11	.120	1.010	1.448
1 1/4	3/16	.188	.875	2.132
1 1/4	1/4	.250	.750	2.670
1 1/2	18	.049	1.402	.7593
1 1/2	16	.065	1.370	.9962



STAINLESS TUBING

SEAMLESS AND WELDED

COLD DRAWN, ANNEALED AND PICKLED

Types 304-316-321

In Standard Mill Lengths

Continued

	Wall	Thickness		Weight
	Inches	Decimal	Inside	Lbs. per
O.D.	and	Equivalent	Diameter	Lin. Ft.
Inches	Gauge	Inches	Inches	(Approx.)
1 1/2	14	.083	1.334	1.256
1 1/2	13	.095	1.310	1.426
1 1/2	11	.120	1.260	1.769
1 1/2	3/16	.188	1,125	2.634
1 1/2	1/4	.250	1.000	3.338
1 3/4	16	.065	1.620	1.170
1 3/4	11	.120	1.510	2.089
1 3/4	3/16	.188	1.375	3.136
1 7/8	13	.095	1.685	1.806
2	16	.065	1.870	1.343
2	14	.083	1.834	1.699
2	11	.120	1.760	2.409
2	3/16	.188	1.625	3,638
2	1/4	.250	1.500	4.673
2 1/4	16	.065	2.120	1.517
2 1/4	11	.120	2.010	2,730
2 1/4	3/16	.188	1.875	4.140
2 1/4	1/4	.250	1.750	5.340
2 1/2	18	.049	2.402	1.283
2 1/2	16	.065	2.370	1.690
2 1/2	14	.083	2.334	2.143
2 1/2	11	.120	2,260	3.050
2 1/2	1/4	.250	2.000	6.008
2 3/4	16	.065	2.620	1.864
2 3/4	11	.120	2.510	3.371
3	16	.065	2.870	2.037
3	14	.083	2.834	2.586
3	11	.120	2.760	3,691
3	3/16	.188	2.625	5.646
3	1/4	.250	2.500	7.343
3 1/4	11	.120	3.010	4.011
3 1/2	16	.065	3.370	2,385
3 3/4	11	.120	3.510	4.652
4	16	.065	3.870	2,732
4	14	.083	3.834	3.472
4	3/16	.188	3.625	7.654





STAINLESS PIPE

COLD DRAWN, ANNEALED AND PICKLED

Types 304-316

In Standard Mill Lengths

Iron	Dian	neter	Wall	Weight Lbs. per
Pipe Size		I.D.	Thickness	Lin. Ft. (Approx.)
Inches	O.D.	1.D.	Inches	(Approx.)
	Schedule 5 -	Light Wall Iron Pi	pe Sizes - Welded	
1 1/2	1.900	1.770	.065	1.274
2	2.375	2.245	.065	1.604
3	3.500	3.334	.083	3.029
	Schedule 10 -	Light Wall Iron P	ipe Sizes - Welded	
3/4	1.050	.884	.083	.8572
1	1.315	1.097	.109	1.404
1 1/4	1.660	1.442	.109	1.806
1 1/2	1.900	1.682	.109	2.085
2	2.375	2.157	.109	2.638
2 1/2	2.875	2.635	.120	3.531
3	3.500	3.260	.120	4.332
3 1/2	4.000	3.760	.120	4.973
4	4.500	4.260	.120	5.613
	Schedule 40 - Stand	ard Iron Pipe Sizes	s - Seamless and Welder	d
1/8	.405	.269	.068	.2447
1/4	.540	.364	.088	.4248
3/8	.675	493	.091	.5676
1/2	.840	.622	.109	.8510
3/4	1.050	.824	.113	1.131
1	1.315	1.049	.133	1.679
1 1/4	1.660	1.380	.140	2.273
1 1/2	1,900	1.610	.145	2,718
2	2.375	2.067	.154	3.653
2 1/2	2.875	2.469	.203	5.793
	3.500	3.068	.216	7,576
3	4.000	3.548	.226	9.109
3 1/2			.237	10.79
4	4.500	4.026	.258	14.62
5	5.563	5.047		
6	6.625	6.065	.280	18.97
8	8.625	7.981	.322	28.55
			ipe Sizes - Seamless	
1/4	.540	.302	.119	.5351
3/8	.675	.423	.126	.7388
1/2	.840	.546	.147	1.088
3/4	1.050	.742	.154	1.474
1	1.315	.957	.179	2.172
1 1/4	1.660	1.278	.191	2.997
1 1/2	1.900	1.500	.200	3.631
2	2.375	1.939	.218	5.022
2 1/2	2.875	2.323	.276	7.661
3	3.500	2.900	.300	10.25
3 1/2	4.000	3.364	.318	12.51
4	4.500	3.826	.337	14,98
5	5.563	4.813	.375	20.78
6	6,625	5, 761	.432	28.57
8	8.625	7.625	.500	43.49
0	0.020	1.020	.000	20.20

STAINLESS 35.

STAINLESS ORNAMENTAL TUBING

(WELDED)

Type 302

Round or Square - Polished or Unpolished
In Standard Mill Lengths

O.D. Inches	Wall Thickness Inches	O.D. Inches	Wall Thickness Inches
5/8	.028 to .065	1	.028 to .083
1/2	.028 to .065	1 1/4	.028 to .083
3/4	.028 to .065	1 1/2	.035 to .083
7/8	.028 to .072	1 5/8	.035 to .083

STAINLESS BEVERAGE TUBING

(WELDED)

Type 304

In 50-foot Coils

	Wall	Thickness		Weight
O.D. Inches	B-W Gauge	Decimal Equivalent Inches	I.D. Inches	Lbs. per Lin. Ft. (Approx.)
1/4 5/16 3/8	25 25 25	.020 .020 .020	.2100 .2725 .3250	.0491 .0626 .0935

For other types, sizes and finishes, consult your nearest Chase Metals Service Center.



CHASE STAINLESS STEEL

STANDARD TOLFRANCES-SEAMLESS PIPE AND TURING

O.D., I.D., AND WALL

Listed OD Sizes: 1/2 inch, 15/32 inch, 7/16 inch, 13/32 inch, 3/8 inch, 11/32 inch, 5/16 inch, 9/32 inch, 1/4 inch

Size	Outside Diameter Inches			iameter* hes	Wall Thickness Percent	
Inches	Over	Under	Over	Under	Over	Under
Size as listed above	.004	.000	60% or more of the OD, See Note 1		10	10
Less than 1/2 OD in size not listed above	.004	.000	See Note 1		15	15
1/2 to 1 OD excl	.005	.000	.000	.005	10	10
1 to 1 1/2 OD excl	.005	.005	.005	.005	10	10
1 1/2 to 3 1/2 OD excl	.010	.010	.010	.010	10	10
3 1/2 to 5 1/2 OD excl	.015	.015			10	10
5 1/2 to 8 OD	.030	.030			10	10

*Tubing having an inside diameter less than 60 percent of the outside diameter, or having a wall 3/4 inch and heavier, cannot be successfully drawn over a mandrel. The inside diameter of such sizes may vary 10 percent over or under the wall thickness. The wall of such sizes may vary 12 1/2 percent over or under.

NOTE 1: Tubing less than 1/2 inch inside diameter cannot be successfully drawn over a mandrel. Consequently, the wall may vary over or under and the inside diameter will be governed by the outside diameter and wall variations.

LENGTH

For Condenser and Heat Exchanger Tubes Plus 1/8" Minus .000 For Mechanical Tubing: Lengths 4' 0'' and shorter Plus 1/16'' Minus .000

STRAIGHTNESS

1 inch in 600 inches

STAINLESS 37.

DATA



CHASE STAINLESS STEEL

STANDARD TOLERANCES-WELDED PIPE

O.D. AND WALL

Nominal	Schedule	Outside	Wall	Inside		rances
Size Inches	Number A.S.A.	Diameter Inches	Thickness Inches	Diameter Inches	O.D. Inches	Wall Thickness
1/8	10S 40S	0.405	0.049 0.068	0.307 0.269	+ .002	± 10%
1/4	10S 40S	0.540	0.065 0.088	0.410 0.364	+ .003 008	<u>+</u> 10%
3/8	10S 40S	0.675	0.065 0.091	0.545 0.493	+ .003 008	<u>+</u> 10%
1/2	5S 10S 40S	0.840	0.065 0.083 0.109	0.710 0.674 0.622	+ .004 010	± 10%
3/4	5S 10S 40S	1.050	0.065 0.083 0.113	0.920 0.884 0.824	+ .005 012	<u>+</u> 10%
1	5S 10S 40S	1.315	0.065 0.109 0.133	1.185 1.097 1.049	+ .005 012	<u>+</u> 10%
1 1/4	5S 10S 40S	1.660	0.065 0.109 0.140	1.530 1.442 1.380	+ .005 012	± 10%
1 1/2	5S 10S 40S	1.900	0.065 0.109 0.145	1.770 1.683 1.610	+ .008 015	<u>+</u> 10%
2	5S 10S 40S	2.375	0.065 0.109 0.154	2.245 2.157 2.067	+ .010 016	± 10%
2 1/2	5S 10S	2.875	0.083 0.120	2.709 2.635	+ .010 016	<u>+</u> 10%
3	5S 10S	3.500	0.083 0.120	3.334 3.260	+ .012 018	± 10%
3 1/2	5S 10S	4.000	0.083 0.120	3.834 3.760	+ .012 018	<u>+</u> 10%
4	5S 10S	4.500	0.083 0.120	4.334 4.260	+ .014 020	± 10%



CHASE STAINLESS STEEL

STANDARD TOLERANCES - ROUND WELDED TUBES

DIAMETER TOLERANCES

In Inches, Plus and Minus

	O.D.	I.D.
Up to 3/32" O.D. exclusive 3/32" to 3/16" O.D. exclusive 3/16" to 1/2" O.D. exclusive 1/2" to 1" O.D. exclusive 1" to 1 1/2" O.D. exclusive 1 1/2" to 2" O.D. exclusive 2" to 2 1/2" O.D. exclusive	+ .001 + .0015 + .003 + .004 + .005 + .006 + .007	± .001 ± .0015 ± .005 ± .006 ± .007 ± .008 ± .010
2 1/2" to 3 1/2" O.D. exclusive 3 1/2" to 5" O.D. inclusive	± .010 ± .015	$\begin{array}{c} \pm .014 \\ \pm .020 \end{array}$

WALL THICKNESS - PERMISSIBLE VARIATION (Inches)

Wall Thickness	B.W.G.	3/16"-1" O.D. (Exclusive)	1''-2'' O.D. (Exclusive)	2''-4'' O.D. (Exclusive)	4''-5'' O.D. (Inclusive)
.025	23	± .002	± .003		
.028	22	± .003	$\pm .003$		
.032	21	± .003	± .003	± .004	
.035	20	± .003	$\pm .004$	± .005	± .005
.042	19	± .003	± .004	$\pm .005$	$\pm .005$
.049	18	± .003	± .004	± .005	± .005
.058	17	+ .004	± .005	± .005	± .006
.065	16	+ .005	± .005	$\pm .005$	$\pm .006$
.072	15	± .005	± .005	$\pm .006$	± .007
.083	14	± .005	± .005	\pm .006	$\pm .007$
.095	13	± .005	± .005	± .006	± .007
.109	12	± .005	± .006	± .007	$\pm .007$
.120	11	± .005	± .006	$\pm .007$	$\pm .007$
.134	10			$\pm .007$	$\pm .007$
.149	9			± .008	± .008
.165	8			± .008	± .008

Intervening wall thicknesses take the wall tolerance for the next gage.

LENGTH TOLERANCES

4 ft. and under up to 2 in. O.D. inclusive Over 2 in. O.D. to 4 in. O.D. inclusive	Plus 1/16'' Plus 3/32''	Minus 0 Minus 0
Over 4 in. O.D. Over 4 ft. to 10 ft. inclusive up to 2 in. O.D. inclusive	Plus 1/8'' Plus 3/32''	Minus 0 Minus 0
Over 10 ft, to 24 ft, inclusive, all sizes	Plus 1/8'' Plus 3/16''	Minus 0 Minus 0

For every 10 ft. or fraction thereof over and above 24 ft. there should be an additional allowance of plus 1/16" minus nothing.



CHASE STAINLESS STEEL

STANDARD TOLERANCES

SQUARE AND RECTANGULAR TUBE

O.D. TOLERANCES

Largest Nominal Outside Dimension	B.W.G.	Outside Tolerances at All Sides at Corners
3/8" to 5/8" inc.	12-23 inc.	<u>+</u> .004''
Over 5/8" to 1 1/8" inc.	10-23 inc.	<u>+</u> .005"
Over 1 1/8" to 1 1/2" inc.	10-23 inc.	± .006''
Over 1 1/2" to 2" inc.	10-21 inc.	± .007"
Over 2'' to 2 1/2'' inc.	10-20 inc.	± .010''
Over 2 1/2" to 3 1/4" inc.	10-18 inc.	± .012"

GAUGE AND STRAIGHTNESS TOLERANCES

GAUGE TOLERANCE: Plus or Minus 10% STRAIGHTNESS: .075'' in 3 feet

RADII OF STANDARD CORNERS

Radii of standard corners are directly dependent upon the gage of tube, as tabulated below:

Square and Rectangular Made from Tubes with Diameter Ranges From	B.W.G.	Radius of Standard Corner
1/2" and under	22	1/32" to 1/16"
1/2" and under	20	1/32" to 1/16"
1/2" and under	18	1/32" to 3/32"
1/2" and under	16	1/32" to 1/8"
Over 1/2" to 2"	22	1/32" to 1/16"
Over 1/2" to 3"	20	1/32'' to 1/16''
Over 1/2" to 4"	18	3/64" to 5/64"
Over 1/2" to 4 1/2"	16	1/16" to 3/32"
3/4" to 4 1/2"	14	5/64" to 7/64"
1'' to 4 1/2''	13	3/32" to 1/8"
1 1/4" to 4 1/2"	12	1/8" to 9/64"
2 1/2" to 4 1/2"	11	1/8" to 9/64"

TWIST TOLERANCES

Longest Side	Maximum Twist in 3 Feet
Under 1/2''	.050''
1/2" to 1 1/2" inc.	.075''
Over 1 1/2" to 2 1/2" inc.	.095''
Over 2 1/2''	.125''



CHASE STAINLESS STEEL

STANDARD TOLERANCES - ROUND ORNAMENTAL TUBING

O.D. TOLERANCES

Electric Welded, Unannealed Tubing, Weld Flash Not Removed

OD Inches	Wall Thickness Inch	BWG	OD Tolerances plus and minus, in.
Under 1/2	.025 to .049	23 to 18	.004
1/2 to 1 Incl.	.025 to .065	23 to 16	.005
1/2 to 1 Incl.	Over .065 to .134	Under 16 to 10	.010
Over 1 to 1 1/2 Inc.	.025 to .065	23 to 16	.008
Over 1 to 1 1/2 Inc.	Over .065 to .134	Under 16 to 10	.010
Over 1 1/2 to 2 Inc.		23 to 18	.010
Over 1 1/2 to 2 Inc.		Under 18 to 14	.009
Over 1 1/2 to 2 Inc.		Under 14 to 9	.012
Over 2 to 2 1/2 Inc.		21 to 16	.012
Over 2 to 2 1/2 Inc.		Under 16 to 12	.011
Over 2 to 2 1/2 Inc.		Under 12 to 8	.014
Over 2 1/2 to 3 1/2 Inc.		21 to 8	.014
Over 3 1/2 to 5 Inc		20 to 8	.020

OVALITY TOLERANCE

Ovality is the difference between maximum and minimum outside diameters measured at any one cross section. There is no additional tolerance for ovality on tubing having a nominal wall thickness of more than 3 per cent of the OD.

An ovality tolerance of twice the tabular OD tolerance spreads shown is applied one-half plus and one-half minus, to tubing having a nominal wall thickness of 3 per cent or less of the nominal OD. The average of the maximum and minimum OD readings should fall within the OD tolerances as shown in the table.

STRAIGHTNESS TOLERANCE

Straightness tolerance is .030 inch in 3 feet.

SQUARE AND RECTANGULAR ORNAMENTAL TUBING

O.D. TOLERANCES

Largest Nominal Outside Dimension	B.W.G.	Outside Tolerances at All Sides at Corners
1/2"-1" Inclusive Over 1"-1 1/2" Inclusive Wall Thickness ± 10%	22-16 18-16	± .007 ± .010

STRAIGHTNESS TOLERANCE: .075" in 3 feet

TWIST TOLERANCE

Larger Dimension	Maximum Twist in Three Feet
Under 1/2''	.032''
1/2" to 1 1/2" inc.	.050''



42. STAINLESS

CHASE METALS SERVICE

MILITARY AND AIRCRAFT SPECIFICATIONS CHASE STAINLESS STEEL TUBING

Specification Number	Description	Type
MIL-P-1144	Pipe: corrosion resisting, Seamless or Welded	304, 316, 321, 347
MIL-T-5695	Tubing: corrosion resisting, Seamless or Welded and Drawn	304
MIL-T-6845	Tubing: corrosion resisting, Aircraft Hydraulic System, Seamless or Welded and Drawn	304
MIL-T-8504	Tubing: corrosion resisting, Annealed, Aircraft Hydraulic System, Seamless or Welded	304
MIL-T-8506	Tubing: corrosion resisting, Annealed, Seamless or Welded	304
MIL-T-8606	Tubing: corrosion resisting, 18-8 Stabilized, Annealed, Seamless or Welded	321, 347
MIL-T-18063	Tubing and Pipe for Nuclear Applications	304, 304L, 347
A.M.S. 5560	Pressure Tubing, corrosion resisting, Annealed, Seamless	304
A.M.S. 5566	Pressure Tubing, corrosion resisting, Seamless or Welded and Drawn	304
A.M.S. 5570	Pressure Tubing, corrosion resisting, Annealed, Seamless	321
A.M.S. 5571	Pressure Tubing, corrosion resisting, Annealed, Seamless	347
A.M.S. 5572	Pressure Tubing, corrosion resisting, Annealed, Seamless	310
A.M.S. 5573	Pressure Tubing, corrosion resisting, Annealed, Seamless	316
A.M.S. 5591	Pressure Tubing, corrosion resisting, Annealed, Seamless	410
A.M.S. 5613	Mechanical Tubing, corrosion and moderate heat resisting, Annealed, usually Seamless	410
A.M.S. 5627	Mechanical Tubing, corrosion and heat resisting, Annealed, usually Seamless	430
A.M.S. 5639	Mechanical Tubing, corrosion resisting, Annealed, usually Seamless	304
A.M.S. 5645	Mechanical Tubing, corrosion and heat resisting, Annealed, usually Seamless	321
A.M.S. 5646	Mechanical Tubing, corrosion and moderate heat resisting, Annealed, usually Seamless	347
A.M.S. 5647	Mechanical Tubing, corrosion and moderate heat resisting, Annealed, usually Seamless	304L
A.M.S. 5648	Mechanical Tubing, corrosion and heat resisting, Annealed, usually Seamless	316
A.M.S. 5650	Mechanical Tubing, corrosion and moderate heat resisting, Annealed, Cold Finished, usually Seamless	309S
A.M.S. 5651	Mechanical Tubing, corrosion and heat resisting, Annealed, Cold Finished, usually Seamless	310
40 0= 1111 = 500		





STAINLESS WIRE



Chase Metals Service Division can supply all standard grades of Stainless Wire. In addition to stocks, detailed on the following pages, excellent delivery can be obtained from mill stocks of Stainless Wire in all grades, sizes, tempers and finishes for any wire application. Stainless Wire can be furnished in coils, on reels or spools, or in straight lengths.

The selection of grades of Stainless Wire is based on the physical and mechanical properties desired, and the corrosive or oxidizing conditions to be met. (See "Mechanical Properties" under "Data," this section, and "Comparative Properties of the Stainless Steel Types" and "Corrosion Resistance of Chase Stainless Steel" in the General Data section of this book.)



STAINLESS ROUND WIRE

TYPE 302

In Coils

X = Stock Sizes*

		Weight Lbs. per	Feet		Coa	ting	
Diameter		Lin. Ft.	per Lb.		000	unb .	
Inches	Temper	(Approx.)	(Approx.)	Bare	Copper	Lead	Oxide
.120	1/8 to 1/4 Hard	.0384	26	X	_	_	_
.105	Soft	.0294	34	X	_	_	_
.091	Spring	.0221	45	_	_	_	X
.080	Soft	.0171	58	X	-	_	
.080	Spring	.0171	58	_	_	_	X
.0625	Spring	.0104	96	х	_	_	_
.062	Spring	.0103	97	_	_	_	X
.048	Spring	.0062	162	x	_	_	_
			166	_	_	_	X
.0475	Spring	.0060			_	_	X
.044	Spring	.0052	193	_	_	_	Λ
.041	Spring	.0045	222	_	_	_	X
.038	Spring	.0039	258	_	_	_	X
.032	Spring	.0027	363	X	_	_	X
.031	Spring	.0026	388	_	_	_	X
.030	Spring	.0024	414	_	_	_	X
.029	Spring	.0023	442	_	_	_	x
.0286	Soft	.0022	458	X	_	_	_
.028	Spring	.0021	476	X	_	_	_
.028	Spring	.0021	476	_	_		X
.027	Spring	.00195	510	_	_	_	X
.026	Spring	.00180	555	_	_	_	X
.025	Spring	.00167	599	_	_	_	X
.024	Spring	.00154	645	_	_	_	X
.023	Spring	.00141	704	_	_	_	X
.022	Spring	.00129	770	_	-	_	X
.021	Spring	.00118	847	_	_	_	x
.020	Spring	.00107	935	_	_	_	X
.019	Spring	.00096	1035	_	_	_	X
.018	Spring	.00087	1152	X	_	_	X
.017	Spring	.00077	1295	_	X	-	_
.016	Spring	.00068	1460	_	х	_	
			1660		X	x	
.015	Spring	.00060		_	X	X	_
.014	Spring	.00052	1910	_	X		
.013	Spring	.00045	2210	_		_	_
.012	Spring	.00038	2600	_	X	_	_
.011	Spring	.00032	3090	_	_	X	_
.010	Spring	.00027	3740	_	X	X	_

^{*}Other types, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.





STAINLESS COLD-HEADING WIRE-ROUND

In Coils

X = Stock Sizes*

	Weight				Туре		
	Lbs. per	Feet	305	305	410	418	430
Diameter	Lin. Ft.	per Lb.	Copper	Lime & Soap	Copper	Copper	Coppe
Inches	(Approx.)	(Approx.)	Coated	Coated	Coated	Coated	Coated
.618	1.0197	1.0	X	_	_	_	_
.614	1.0066	1.0	X	_	_	_	_
.555	.8224	1.2	X	_	_	_	_
.490	.6411	1.6	X	_	_	_	_
.485	.6281	1.6	X	_	_	-	_
.440	.5169	1.9	X	_	_	_	_
.430	.4936	2.0	_	_	_	X	_
.425	.4823	2.1	X		_	_	_
.390	.4061	2.5		_	_	X	
.369/.371	.3655	2.7	_	_	X	_	X
.365	.3557	2.8	X	_	_	_	_ x
.339/.341	.3087	3.2	_	_	_ x	_	X
.325/.328	.2846	3.5	X	X			X
.324/.326	.2820	3.5	_	_	_		X
.309/.311	.2566	3.9	-	_	_	_	Λ
.304	.2468	4.1	X X	_	_	_	_
.272	.1975	5.1 5.1		_	X	X	X
.269/.271	.1946		_	x	_	_	_
.269 .267/.269	.1932 .1918	5.2 5.2	x	_	_	_	x
243/.245	.1590	6.3	x	_	_	_	X
.242	.1564	6.4	x	_	-	_	
.241	.1551	6.4	X		_	_	_
.220/.222	.1304	7.7		_	_	_	X
.213/.215	.1223	8.2	_	_	X	_	X
.211/.213	.1200	8.3	X	_	X	_	X
.210/.212	.1189	8.4	_	-	_	_	X
.209/.211	.1177	8.5	X	_	X	_	X
.203	.1100	9.1	X	_	X	_	_
1975/.1995	.1052	9.5	_	_	X	_	X
.188/.190	.09375	10.7	_	_	X	_	_
.183/.185	.09040	11.1	X		_	_	X
1815/.1835	.08891	11.2	_	_	X	_	-
.181	.08747	11.4	_		_	_	X
.180	.08651	11.6	X	_	_	_	_
.169/.171	.07716	13.0	_	-	X	_	X
.164/.166	.07269	13.8	X	_	X-	_	X
.163/.165	.07181	13.9	X	_	_	_	X
.159/.161	.06835	14.6	X	_		_	_
1575/.1595	.06708	14.9	_	_	X		
.155/.157	.06498	15.4	X	-	-	_	_ x
1515/.1535	.06209	16.1		_	X	_	X
.150/.152	.06088	16.4	X	_	_ v	_	X
.147/.149	.05848	17.1	X	_	X	_	Λ

Continued

^{*}Other types, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center.

STAINLESS COLD-HEADING WIRE-ROUND

In Coils
Continued

SASS-COPPE

X=Stock Sizes*

	Weight				Туре		
	Lbs. per	Feet	305	305	410	418	430
Diameter	Lin. Ft.	per Lb.	Copper	Lime & Soap	Copper	Copper	Copper
Inches	(Approx.)	(Approx.)	Coated	Coated	Coated	Coated	Coated
.147	.05770	17.3	_	_	_	_	X
.145/.147	.05691	17.6	_	_	_	_	X
.1445/.1465	.05652	17.7	_	_	X	_	X
.1435/.1455	.05575	17.9	_		X	_	X
.139/.141	.05233	19.1	X	_	X	_	X
.1385/.1405	.05196	19.2	_	_	_	_	X
.133	.04723	21.2	_	_	X	_	_
.130/.132	.04582	21.8	X		_	_	X
.129/.131	.04512	22.2	X	_	X	_	X
.1225	.04005	25.0	_	_	X	_	_
.120	.03845	26.0	X		_	_	_
.118/.119	.03749	26.7	-	_	_	_	X
.117/.119	.03718	26.9	_	_		_	X
.117	.03655	27.4	X	_	_	_	X
.113/.115	.03470	28.8	X		X	-	X
.112/.114	.03409	29.3	X	_	-	-	_
.112	.03349	29.9	_	_	_	_	
.1105/.1125	.03319	30.1	X	-	X	_	X
.109/.111	.03231	31.0	X		X	_	_
.1085/.1105	.03201	31.2	_	_	_	_	_
.108/.110	.03172	31.5	_	_	X	_	X
.1075/.1095	.03143	31.8		_	X	_	_
.1045/.1065	.02972	33.6	X	_	_	_	X
.102/.104	.02833	35.3	_	_		_	X
.0925/.0945	.02334	42.8	_	_	X		_
.0915/.0935	.02285	43.8	X	_	X	-	X
.090/.091	.02187	45.7	X	_		_	_
.0895/.0915	.02550	39.2	_	_	X	_	X
.0885/.0905	.02390	41.8	_	_	X	_	77
.085	.01929	51.8	_	_	-	_	X
.081/.083	.01795	55.7	X	_	_	_	X
.070/.072	.01346	74.3	X		_	_	X
.065	.01128	88.7	X	-	_	_	_

STAINLESS ROUND WIRE-TYPE 304

In Coils and On Spools

		III COLLD III	ia on opoore		
Diameter Inches	In Coils Weight Lbs. per Lin. Ft. (Approx.)	Feet per Lb. (Approx.)	Diameter Inches	On Spools Weight Lbs. per Lin. Ft. (Approx.)	Feet per Lb. (Approx.)
.095	.0241	41	.051	.0069	144
.072	.0138	72	.038	.0039	258
.067	.0120	83	.0275	.0020	500
.062	.0103	97	.024	.00154	645
.054	.0078	128	.013	.00045	2210
.047	.0059	170			
.041	.0045	222			
0286	0022	458			

^{*}Other types, sizes and finishes can be furnished from mill stocks. Consult your nearest Chase Metals Service Center



CHASE STAINLESS STEEL

STANDARD TOLERANCES-COLD DRAWN WIRE AND HOT ROLLED RODS-COILS

SIZE TOLERANCES

COLD DRAWN COARSE AND FINE WIRE

Rounds only

Size	Tolerance Inches		
Inches	Over	Under	
/8 to 1/2 incl	.002	.002	
/2 to 5/16	.0015	.0015	
/16 to .044	.001	.001	
044 to .033	.0008	.0008	
033 to .024	.0005	.0005	
024 to .012	.0004	.0004	
012 to .008	.0003	.0003	
008 to .00476	.0002	.0002	
00476 to .003	.0001	.0001	

COLD DRAWN COARSE WIRE

Squares, Hexagons and Octagons

Distance Across Flats	Tolerance Inches		
Inches	Over	Under	
1/2	0	.004	
under 1/2 to 5/16 incl	0	.003	
under 5/16 to 1/8 incl	0	.002	

WIRE

DATA

MECHANICAL PROPERTIES CHASE STAINLESS STEEL WIRE

The various tempers or stiffnesses obtainable on cold drawn wire are often referred to as annealed, 1/8 hard, 1/4 hard, 1/2 hard, and full hard. Tables below give the tensile strength and hardness that are obtained for a given temper in various sizes.

TYPES 302, 304, 316, 309, 310, 303, 347 and 321

Sizes 1/32 to 3/32 in. dia				Sizes 3/32	to 1/4 in. diam	
			Tensile	Tensile		
Temper	Form	Hardness	Strength, psi	Hardness	Strength, psi	
Annealed	Bars*	Rb 95 max	95 000-125 000	Rb 95 max	95 000-125 000	
	Coils	Rb 95 max	85 000-120 000	Rb 95 max	95 000-120 000	
1/8 Hard	Bars*	Rb 97-103	125 000-145 000	Rb 95-100	120 000-140 000	
-,	Coils	Rb 95-100	120 000-140 000	Rb 95-100	115 000-135 000	
1/4 Hard	Bars*	Rc 25-30	140 000-170 000	Rc 25-30	125 000-150 000	
	Coils	Rc 25-30	140 000-170 000	Rc 25-30	125 000-150 000	
1/2 Hard	Bars*	Rc 30-35	150 000-200 000	Rc 30-35	140 000-160 000	
	Coils	Rc 30-35	150 000-200 000	Rc 30-35	140 000-160 000	
Full Hard	Bars*	Rc 40-45	200 000-240 000	Rc 38-43	160 000-210 000	
	Coils	Rc 40-45	220 000-255 000	Rc 38-43	175 000-235 000	
		Sizes 1/4	to 3/8 in. diam	Sizes 3/8	to 9/16 in. diam	
			Tensile		Tensile	
Temper	Form	Hardness	Strength, psi	Hardness	Strength, psi	
Annealed	Bars*	Rb 95 max	95 000-115 000	Rb 95 max	90 000-110 000	
Annealed	Bars* Coils	Rb 95 max Rb 95 max	95 000-115 000 90 000-110 000	Rb 95 max Rb 95 max	90 000-110 000 85 000-110 000	
					85 000-110 000 105 000-125 000	
Annealed 1/8 Hard	Coils	Rb 95 max	90 000-110 000	Rb 95 max	85 000-110 000	
	Coils Bars*	Rb 95 max Rb 95-100	90 000-110 000	Rb 95 max Rb 95-100	85 000-110 000 105 000-125 000 100 000-120 000 115 000-135 000	
1/8 Hard	Coils Bars* Coils	Rb 95 max Rb 95-100 Rb 95-100	90 000-110 000 105 000-125 000 105 000-125 000	Rb 95 max Rb 95-100 Rb 95-100	85 000-110 000 105 000-125 000 100 000-120 000	
1/8 Hard	Coils Bars* Coils Bars*	Rb 95 max Rb 95-100 Rb 95-100 Rc 25-30	90 000-110 000 105 000-125 000 105 000-125 000 110 000-130 000	Rb 95 max Rb 95-100 Rb 95-100 Rc 23-28 Rc 23-28 Rc 28-33	85 000-110 000 105 000-125 000 100 000-120 000 115 000-135 000 115 000-135 000 125 000-145 000	
1/8 Hard	Coils Bars* Coils Bars* Coils	Rb 95 max Rb 95-100 Rb 95-100 Rc 25-30 Rc 25-30	90 000-110 000 105 000-125 000 105 000-125 000 110 000-130 000 110 000-130 000	Rb 95 max Rb 95-100 Rb 95-100 Rc 23-28 Rc 23-28	85 000-110 000 105 000-125 000 100 000-120 000 115 000-135 000 115 000-135 000	
1/8 Hard	Coils Bars* Coils Bars* Coils Bars*	Rb 95 max Rb 95-100 Rb 95-100 Rc 25-30 Rc 25-30 Rc 30-35	90 000-110 000 105 000-125 000 105 000-125 000 110 000-130 000 110 000-130 000 130 000-150 000	Rb 95 max Rb 95-100 Rb 95-100 Rc 23-28 Rc 23-28 Rc 28-33	85 000-110 000 105 000-125 000 100 000-120 000 115 000-135 000 115 000-135 000 125 000-145 000	

^{*}Bars 5/8 in. diam and smaller were straightened and cut from cold drawn coils.

NOTE: Rb is Rockwell B hardness and Rc is Rockwell C hardness.

Stainless Steel Types 309 and 310 are not specified in tensile strength over 125,000-145,000 psi.

Stainless Steel Type 316 in a given size range has a slightly lower tensile strength than is shown for the full hard condition. The values tabulated in the above table are approximations and should be used as a guide only.

TYPES 410 and 430

Sizes 1/32 to 9/16 in. Diam

Temper	Form	Hardness	Tensile Strength, psi
Annealed	Bars*	Rockwell B 76-88	77 000 - 87 000
	Coils	Rockwell B 76-85	75 000 - 85 000
1/8 Hard	Bars*	Rockwell B 85-95	80 000- 95 000
	Coils	Rockwell B 85-95	80 000- 95 000
1/4 Hard	Bars*	Rockwell B 93-98	95 000-105 000
	Coils	Rockwell B 93-98	95 000-105 000
1/2 Hard	Bars*	Rockwell B 96-100	100 000-115 000
	Coils	Rockwell B 96-100	100 000-115 000
Full Hard	Bars*	Rockwell B 100-104	110 000-130 000
	Coils	Rockwell B 100-104	110 000-130 000

^{*}Bars 5/8 in. diam and smaller were straightened and cut from cold drawn coils.

NOTE: The values tabulated in the above table are approximations and should be used as a guide only.

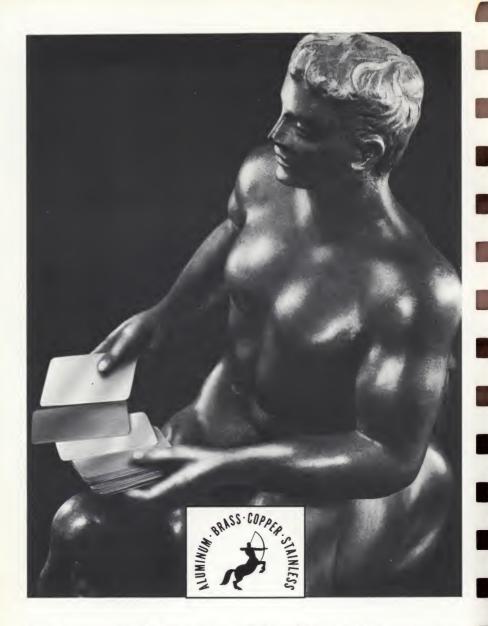


CHASE STAINLESS STEEL WIRE

Approximate Feet Per Pound - Round Wire, Type 302, 304

(For Type 430, add about 2 percent more feet per pound)

Size Inches	Feet per Lb.	Size Inches	Feet per Lb.	Size Inches	Feet per Lb
.002	94 058	.034	322	.066	85
.002	41 432	.035	305	.067	82
	23 300	.036	286	.068	80
.004	15 000	.037	272	.069	78
.006	10 570	.038	258	.070	76
.007	7 620	.039	244	.071	74
.008	5 835	.040	233	.072	72
.009	4 615	.041	222	.073	70
.010	3 740	.042	212	.074	68
.011	3 090	.043	202	.075	66
.012	2 600	.044	193	.076	64
.013	2 210	.045	185	.077	62
.014	1 910	.046	176	.078	61
.015	1 660	.047	169	.079	60
.016	1 460	.048	162	.080	58
.017	1 295	.049	156	.081	57
.018	1 152	.050	150	.082	56
.019	1 035	.051	143	.083	54
.020	935	.052	138	.084	53
.021	847	.053	133	.085	52
.022	760	.054	128	.086	51
.023	704	.055	123	.087	49
.024	645	.056	119	.088	48
.025	599	.057	115	.089	47
.026	555	.058	111	.090	46
.027	510	.059	108	.100	37
.028	476	.060	104	.105	34
.029	442	.061	100	.125	24
.030	414	.062	97	.156	15.50
.031	388	.063	94	.187	10.6
.032	363	.064	91	.250	5.9
.033	342	.065	88		



The Centaur deals you a new "full house" of metals! Look no further for <u>complete</u> multi-metals service! Chase carries a full house of ALUMINUM, BRASS, COPPER, STAINLESS. Unbeatable quality. Competitive prices. Get the metal you want, when you want it from Chase. One call gets all—including technical service.

FITTINGS

AUTOMOTIVE

PIPE

DRAINAGE

PLASTIC TUBE

FLARED

SOLDER-JOINT

INDUSTRIAL VALVES

PLASTIC INSTRUMENT TUBE

Accessories



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PLASTIC INSTRUMENT TUBE 12





CHASE SOLDER-JOINT, FLARED, INDUS-TRIAL AND AUTOMOTIVE FITTINGS



Chase wrought copper fittings may be used for plumbing, heating, refrigeration, air conditioning, and for any other piping where copper tube itself is used. All these wrought copper fittings, except some threaded fittings, are made of commercially pure copper.

Chase quality cast fittings for use with copper tube for plumbing and heating lines, and other applications, are produced by modern casting techniques to assure consistent good quality and soundness. They are carefully machined to facilitate assembly and promote even distribution of solder.

Flared Chase copper water tube fittings are made from commercially pure casting metal in accordance with A.S.T.M. Specification B62, and they meet Federal Specifications for Grade A castings.

All Chase brass industrial and automotive fittings are manufactured to S.A.E. standards. All pipe threads are made to S.A.E. Dryseal (short) specifications. All fittings have flat wrench surfaces, a feature that contributes to ease and speed in assembly operations.

IMPORTANT NOTE: Only a few representative fittings from each line of fittings are illustrated on the following pages. Chase Metals Service Division can supply a complete line of fittings and valves for every application!

FITTINGS 1.



SOLDER-JOINT COPPER TUBE FITTINGS



Chase Solder-Joint copper tube fittings are used with copper tube for plumbing and industrial installations. Chase Solder-Joint Fitting connections have been tested far beyond the strain of actual service.

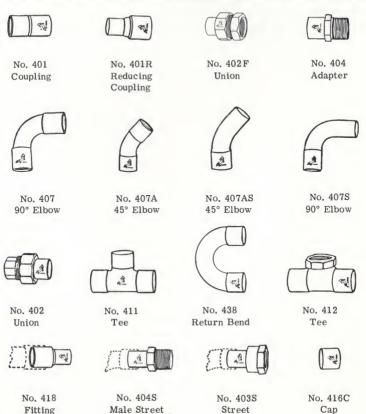
The illustrations below show only a representative collection of our complete line of solder-joint wrought copper fittings. These and many others are carried in Chase Metals Service Division stocks. For further information on tube fittings, call your nearest Chase Metals Service Center.

SOLDER-JOINT WROUGHT COPPER FITTINGS

Chase wrought copper fittings may be used with equal success for plumbing, heating, refrigeration, air

conditioning, and for any other piping where copper tube itself is satisfactory.

Chase wrought copper fittings are made in adequate thickness and weight to insure soundness and strength, and they are finished in the proper temper for adequate rigidity.



Adapter

Adapter

Reducer



SOLDER-JOINT CAST BRONZE FITTINGS

Recognizing the desirability of cast fittings for certain installations, Chase Metals Service Division has a comprehensive line of high quality cast fittings in stock, only a sampling of which is illustrated here.

Chase cast bronze Solder-Joint fittings are made from commercially pure casting metal having a nominal composition of 85% copper, 5% zinc, 5% lead, 5% tin. These fittings meet Federal Specifications for Grade A castings.

Chase cast bronze Solder-Joint fittings are carefully inspected and are tested at 90 lbs. air pressure under water.



No. C 403S Female Street Adapter



No. C 408A 45° Elbow



No. C 421U Range Boiler Fitting with Union



No. C 408 90° Elbow



No. C 408U Union Elbow



No. C 409U Union Elbow



No. C 409 90° Elbow



No. C 408F Flanged Elbow



No. C 412 Tee



No. C 412D Tee



No. C 413 Tee



No. C 437 Wash Tray Tee



No. C 421 Range Boiler Fitting



No. C 416C



No. C 404S Street Adapter



No. C 416P Plug



No. C 441 Companion Flange



No. C 435 Cross



No. C 408D Drop Ear Elbow



No. C 420 U Range Boiler Fitting with Union



FLARED COPPER WATER TUBE FITTINGS



Chase Flared Copper Water Tube Fittings are used with soft temper copper tube for "in the wall" replacements, general plumbing work, and underground water lines. Their strength makes them suitable, too, for liquified petroleum gas and oil burner installations.

These fittings are made from commercially pure casting metal, having a nominal composition of 85% copper, 5% zinc, 5% lead, 5% tin and they meet Federal Specifications for Grade A castings,

Chase Flared Copper Water Tube Fittings are carefully inspected and tested at 90 pounds of air pressure under water. Chase one-half inch soft temper cop-

per water tube and Flared Fittings have withstood over 3000 lbs. water pressure per square inch. (Average city water pressure is 30 to 120 lbs.)

The illustrations below show a representative collection of our entire line of flared fittings. Each is available in standard sizes from our stocks. For complete information write to the nearest Chase Metals Service Center.







No. 316C Cap



No. 303 Female Adapter



No. 304 Male Adapter



No. 309 90° Elbow



No. 308 90° Elbow



No. 311 Tee



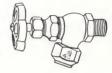
No. 300 Sleeve Nut



No. 329 Tank Slip Fitting



No. 301 3 Part Union



No. 1028 Tank Valve



Nos. 480-481 Sizing Tool



No. 1014A Flanging Tool



SOLDER-JOINT DRAINAGE FITTINGS

for Soil. Waste and Vent Lines

Chase copper tube and copper or bronze fittings when used together in soil, waste and vent lines provide maximum resistance to corrosion and the interior smoothness of copper tube and the solder-joint fittings reduces the liability of stoppage.

Chase Solder-Joint Drainage Fittings are available in sturdy cast bronze or wrought copper. Both types are made to ASA specification for drainage fittings.

The fittings illustrated below are a representative collection of our complete line. For full information and for sizes call or write your nearest Chase Metals Service Center.

CAST FITTINGS



Style No. 907 90° Elbow



Style No. 908 22 1/2° Elbow



Style No. 909 11 1/4° Elbow



Style No. 960 60° Elbow



Style No. 971 90° Side Inlet T-Y 90° Side Inlet T-Y



Style No. 972



Style No. 935 90° Double T-Y



Style No. 911-7 90° T-Y



Style No. 911-15 90° T-Y



Style No. 911-14 90° T-Y



Style No. 911 90° T-Y



Style No. 907-7 90° Elbow

WROUGHT FITTINGS



Style No. 201-R Reducing Coupling



Style No. 223 Vent Increaser



Style No. 207 90° Elbow



WROUGHT EXPANSION JOINT

(Copper to Fitting)

Style No. 445



Nominal Size	Actual O.D. Size	Approx. Net Wt.	Pkg. Quan.	Nominal Size	Actual O.D. Size	Approx. Net Wt.	Pkg. Quan.
*1/2"	5/8"	.23	12	1 1/4"	1 3/8"	1.25	1
3/4"	7/8"	.47	12	1 1/2"	1 5/8"	1.69	1
1''	1 1/8"	.88	1	2''	2 1/8"	2.62	1

^{*}Copper to Copper

BRONZE SOLDER-JOINT AND THREADED VALVES

Chase Metals Service Centers stock a comprehensive line of solder-joint and threaded bronze valves of the highest possible quality. The line, of which only a few representative numbers are illustrated below, includes Gate Valves, Globe Valves, Swing Check Valves, Stops, Stop and Waste Valves, Boiler Drains, Sill Cocks and Balancing Valves.



Style No. 429 Gate Valve



Style No. 475 Stop



Style No. 486 Swing Check



Style No. 462 Sill Cock

SILNIC BRONZE TUBE STAPLES



Nominal Size	Actual O.D. Size	Approx. Net Wt. Per 100	Pkg. Quan.	Nominal Size	Actual O.D. Size	Approx. Net Wt. Per 100	Pkg. Quan.	
1/4''	3/8''	.285	100	1/2''	5/8''	.835	100	
3/8''	1/2''	.335	100	3/4''	7/8''	1.560	100	



COPPER TUBE STRAPS



Style No. 1019

Nominal Size	Actual O.D. Size	Approx. Net Wt. Per 100	Pkg. Quan.	Nominal Size	Actual O.D. Size	Net Wt. Per 100	Quan.
1/8"	1/4"	.58	100	3/4"	7/8"	2.10	100
1/4"	3/8"	.80	100	1''	1 1/8"	2.80	100
3/8"	1/2"	1.10	100	1 1/4"	1 3/8"	4.00	50
1/2"	5/8"	1.30	100	1 1/2"	1 5/8"	5.60	50
5/8"	3/4"	1.80	100	2''	2 1/8"	7.40	100



Style No. 1019-R

3/8" x 1/8"	1/2" x 1/4"	1.60	100	1/2" x 1/4"	5/8" x 3/8"	2.00	100
3/8" x 1/4"	1/2" x 3/8"	1.80	100				

TIN AND LEAD SOLDER

Wire Solder-1-pound and 5-pound Spools

	Liquidus	Solidus	1	Liquidus	Solidus
95% Tin, 5% Anti-			50% Tin, 50% Lead	421°F	361°F
mony	465°F	450°F	40% Tin, 60% Lead	460°F	361°F

NOKORODE SOLDERING FLUX

We supply Nokorode Soldering Flux packaged as follows:

1-pound cans — 6 cans to carton 2-ounce cans—12 cans to carton



SAND CLOTH

1 1/2 inches Wide



		Weight	1		Weight
Size	Rolls	Lbs. per	Size	Rolls	Lbs. per
of Roll	per Box	Roll (Approx.)	of Roll	per Box	Roll (Approx.)
10-yd.	5	.32	50-yd.	1	1.50
25-yd.	1	.75			

FITTINGS 7.

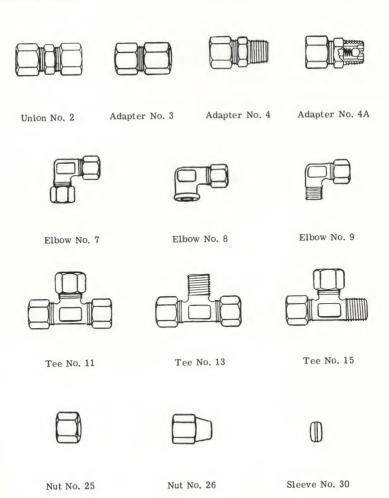
BRASS COMPRESSION FITTINGS

Chase Brass Compression Fittings provide a simple, inexpensive means of making brass or copper tube connections on automotive, industrial, heating and process plant equipment.

In making the compression fitting connection, the nut is slipped over the tube, with the threads facing the end of the tube to be connected. Next, the sleeve is placed on the tube, and the tube forced into the body of the fitting as far as the body shoulder will permit. The nut is then drawn up and tightened. In tightening, the nut compresses the sleeve with a spinning action, making a leakproof bond between tube and fitting.

Compression Ells and Tees are cast. Adapters, Unions, Nuts and Sleeves are turned from extruded rod.

The fittings illustrated below are just a representative collection of our entire line. For more complete information on Brass Compression Fittings, contact your nearest Chase Metals Service Center.





BRASS FLARED (SAE) FITTINGS

Chase Brass Flared (SAE) Fittings are made to very rigid specifications which assure uniform quality. Flared (SAE) fitting connections are made by flaring the tube end with a simple flaring tool. The nut and fitting body are pulled up with a wrench and make a tight joint. Since fitting threads are free-running, it is easy to determine when the joint is tight.

Flared Ells and Tees are cast, though some sizes are also available as forgings. Adapters, Unions, No. 125 and No. 126 Nuts are turned from extruded rod. Nuts No. 127 and No. 128 (not illustrated) are forged.

The fittings illustrated below are a representative collection of our entire line. For more complete information on Brass Flared (SAE) Fittings, contact your nearest Chase Metals Service Center.









Union No. 102

Reducing Union No. 102

Adapter No. 103

Adapter No. 104









Elbow No. 107

Elbow No. 108

Elbow No. 109

Elbow No. 708







Tee No. 113



Tee No. 115







Long Nut No. 126

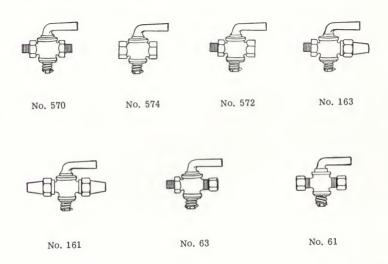


BRASS INVERTED FLARED FITTINGS

Chase Inverted Flared Fittings provide connections similar to those obtained with Flared (SAE) Fittings, but give better tube support, since the tube is held both inside and outside at contact with the body of the fitting. Uniformity of wall thickness provides extra wall strength. Ells and Tees are cast. Unions and Nuts are turned from extruded rod.

For complete information on Inverted Flared Fittings contact your nearest Chase Metals Service Center.

ROUGH BRASS SHUT-OFF COCKS



For complete information and sizes of Rough Brass Shutoff Cocks contact your nearest Chase Metals Service Center.



BRASS PIPE FITTINGS

Standard Pipe Thread

We have Brass Pipe Fittings in stock in all sizes up to and including 4". Larger sizes can also be supplied promptly. Your inquiries are invited.



Elbow No. 501



45^o Elbow No. 502



Street Elbow



Street Elbow With Flats No. 506



45⁰ Street Elbow No. 507



Tee No. 508



Union No. 513



Coupling No. 515



Reducing Coupling No. 516



Flange No. 517



Bushing No. 519



Cap No. 521



Adapter No. 523



Reducing Adapter No. 524



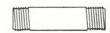
Hexagon Nipple No. 525



Reducing Hexagon Nipple No. 526



Close Nipple No. 527



Long Nipple No. 528



Lock Nut No. 529



Square Head Plug No. 531



Tee Head Plug No. 532



Hex Head Plug No. 533



Countersunk Head Plug No. 534



Slotted Head Plug No. 535

CHASE BRASS FITTINGS FOR PLASTIC TUBE

A complete line of Brass Fittings for Plastic Tube in low or high pressure styles, in 1/4", 5/16" and 3/8" O.D. tube sizes is available from Chase Metals Service Centers. Assembly to tube is simple. Low pressure fittings are assembled by slipping the nut over the tube, pushing the tube over the insert, and turning the nut on the body finger-tight. For the high pressure style, insert the tube into the assembled fitting and turn the nut with a wrench until tight.

Note the Delrin Sleeve, No. 655, and Brass Insert, No. 657, which are available in 1/4", 5/16" and 3/8" O.D. tube sizes for converting standard compression fittings for use with plastic tube.



High Pressure Angle Valve No. 680 Plastic Tube to M.P.T.



Low Pressure Nut No. 625



Low Pressure Coupling No. 604 Plastic Tube to M.P.T.



High Pressure
Male Adapter No. 669
Plastic Tube to M.P.T.



High Pressure Nut No. 660



Brass Insert No. 657



Delrin Sleeve No. 655

PLASTIC INSTRUMENT TUBE

Chase plastic instrument tube is a top-quality polyethylene tube made specifically for the instrument industry. It is non-toxic, odorless, and tasteless, and remains flexible over a wide range of temperatures. In addition, it is inert to the corrosive action of chemicals and solvents.

O.D. Inches	Wall Thickness	I.D.	Weight Lbs. per 100 Ft. Approx.	Recommended Safe Working Pressure	Colors
1/4	.040	.170	1.05	120	Black, natural, blue, red, green, yellow
1/4	.062	.125	1.52	190	Black, natural
5/16	.062	.187	1.96	150	Black, natural
3/8	.062	.251	2.66	125	Black, natural, blue, red, green, yellow

Chase plastic tube is furnished on 500 ft. disposable reels.

SPECIALTIES

CONTINUOUS CAST BRONZE BARS COPPER SHOT ALLOY **FASTENERS** GRILLE CLOTH COPPER HAMMERS INSECT WIRE SCREENING PERFORATED METAL ROOFING PRODUCTS SOLDERING COPPERS SOLDER STRAINER CLOTH WIRE CLOTH

CHASE METALS SERVICE

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SPECIALTY PRODUCTS



Chase Metals Service stocks, in brass, bronze, copper, aluminum and stainless, a wide variety of specialties that are needed in production assembly, construction and plant and equipment maintenance. Included are fastenings—bolts and nuts, rivets and burs, nails and tacks, cotter pins, escutcheon pins, cap screws, etc.

Also stocked are copper roofing products, insect screening and wire cloth, bearing bronze, soldering coppers, copper hammers, copper shot, etc.



Many specialties are packaged in small units for resale, or for the small and occasional user, and are also supplied in bulk for the user of substantial quantities.

We invite your inquiries on related items that are not catalogued. Our line is changing and expanding constantly, and we may be in a good position to give you excellent delivery at a reasonable price on any of your requirements.





COPPER ROOFING PRODUCTS



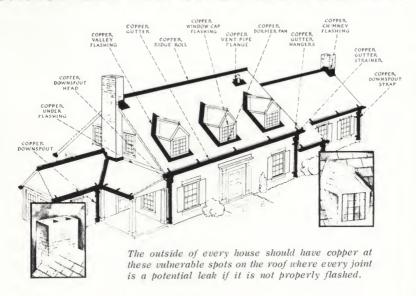
Long recognized and accepted as durable, dependable and architecturally attractive, copper roofing products are popularly used not only in residential construction, but in the construction of all types of commercial and public buildings.

Copper sheet, strip and roll for roofing applications are carried in stock, as well as a wide selection of copper roofing accessories including gutters, downspouts, elbows, shoes, mitres, straps, etc.

Copper Roofing Specialties are catalogued on the following pages. For sheet, strip and roll copper, see Pages 12-19 in the COPPER section of this catalog.



CHASE COPPER ROOFING PRODUCTS

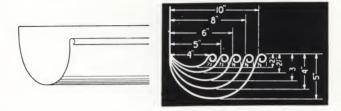


Durability is an important factor in the flashing of all types of buildings large and small, public and residential. Therefore, Copper should always be specified for roofs, flashings, downspouts, gutters and all types of roofing accessories.

COPPER GUTTERS

Chase Gutters are made from 16 oz. copper. Heavier weight can be furnished to special order but we do not advocate nor stock anything lighter than 16 oz.

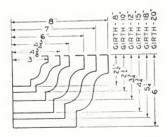
HALF ROUND COPPER GUTTERS

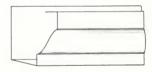


Chase Half Round Gutters are uniform in width throughout the entire length and true to size and shape. Standard gutter is Single Bead, Lap Joint; Sizes 4" to and including 10". Lengths 10 ft.

Your assurance of full weight material is the "Chase - $16\ \text{oz.}$ " stamp on each length.

O. G. COPPER GUTTERS-STYLE K





Style K, O.G. Box Gutters are made in 10 ft. lengths from 16 oz. copper and are usually carried in stock in 10" and 12" girths; other sizes can be made to order.

COPPER DOWNSPOUTS



The following are the dimensions of square corrugated down-spouts: Diameters of round and corrugated round downspouts are listed in description below.

List Size	Short Side (A)	Long Side (B)
2" (1 x 2)	1 7/8"	2 3/8"
3'' (2 x 3)	2 1/4"	3''
4'' (3 x 4)	2 3/4"	4 3/16"
5'' (4 x 5)	3 5/8"	5 1/16"

Chase Copper Downspouts are made in lengths of 10 feet. The corrugations are deep and even, which is a genuine protection against bursting from ice expansion. The seams are tightly locked with a power press and are uniform throughout the entire length. Each length is die-stamped with the Chase trade-mark and "16-oz.", which is your protection against downspouts made from light weight copper sheets.

Chase Copper Downspouts come in three types and five sizes: plain round and corrugated round in 2, 3, 4, 5 and 6 inch diameters; corrugated square in 2, 3, 4 and 5 inch sizes. All downspouts are normally carried in stock in 10-ft. exact lengths.

CHASE COPPER ROOFING ACCESSORIES

Also available, Chase Copper Gutter Hangers, Downspout Straps, Elbows, Shoes, Mitres and all necessary Copper Roofing Accessories.

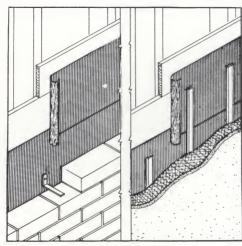


CHASE COP-O-TOP

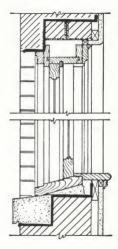


Chase Cop-O-Top has long been recognized and used as the most durable and reliable low cost flashing, employing the everlasting protection of copper. For public and commercial buildings, Cop-O-Top is recommended for water-proofing spandrel beams and dampproofing concrete foundations.

For residences, Cop-O-Top is recommended for sheathing floors, roofs and attics. Also, for flashing around windows and doors, for dampproofing cellars and foundation walls, and for protection against termites and other vermin.



Sheathing and dampproofing stucco and brick veneer buildings.



For Flashing around Window Heads and Sills

INSTALLATION DETAILS

The new Chase Cop-O-Top is an approved product employing Chase electrodeposited sheet copper of precise uniform thickness inseparably bonded to a heavy weight crepe kraft paper impregnated with asphalt, which is reinforced with glass or sisal fibers about every 1/4" in both directions. The combination of copper bonded to asphalt-kraft paper, reinforced with glass or sisal fibers applied under tension, produces an extremely tough and flexible product that resists tearing, kinking and cracking with rough handling. Chase Cop-O-Top folds and forms easily with the single thickness of kraft paper yet maintains strength with the glass or sisal fiber reinforcement. Chase Cop-O-Top can be folded and formed by hand to fit into nooks and corners, and around odd shapes without breaking. The asphalt content in Chase Cop-O-Top is plastic and adheres tightly around nails, eliminating seepage of moisture or air through nail holes. These features, together with the rustproof advantages of copper, make Cop-O-Top especially practical for all types of waterproofing, dampproofing and insulating purposes. Cop-O-Top is not recommended for flashing exposed surfaces.



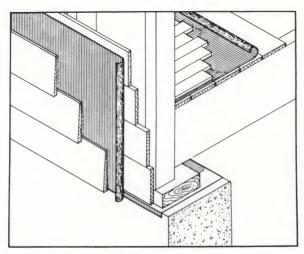
CHASE COP-O-TOP

SPECIFICATIONS

COP-O-TOP: All concealed flashing shall be Cop-O-Top made of electrodeposited copper bonded to creped heavy duty kraft paper, impregnated with asphalt, and reinforced with glass or sisal fibers in both directions.

WEIGHTS AND CONSTRUCTION

Cop - O - Top - 1, 2 or 3 ounce (weight per square foot) electro-deposited copper for light, medium or heavy duty use. Standard ply or sandwich laminations (kraft paper plus glass or sisal fibers - copper - kraft paper).



For sheathing residences (attach with copper tacks).

INSTALLATION DETAILS

SPECIFICATIONS

- 1. Federal Chase Cop-O-Top meets Federal specification number UU-P-147B
 Type V and 1.2 Classes A, B and C.
- G.S.A. Chase 3 ounce Cop-O-Top is marked in accordance with General Services Administration stock specification for Spandrel flashing as follows:

36A.—Spandrel flashings which include electro-sheet copper shall be identified by imprinting or otherwise indicating by numerals on the surface the weight in ounces per square foot of the electro-sheet copper using repetitive pattern to appear on the surface of the material at least every 12 inches of length regardless of the width.

- 3. F.H.A. Chase 3 ounce Cop-O-Top meets FHA minimum property standards paragraph 902-2.2.
- Corps of Engineers Chase 3 ounce Cop-O-Top meets requirements of Corps of Engineers specification for sheet metal work Sect. 6E 220.8 Int. Para H. Sec. (3).
- V.A. Chase 3 ounce Cop-O-Top meets all Veterans Administration requirements for membrane flashing.

(Continued)



CHASE COP-O-TOP

(Continued)

STANDARD ROLLS - 120 FEET LONG

Standard Widths (Inches)	Area Per Roll (Sq. Feet)	Standard Widths (Inches)	Area Per Roll (Sq. Feet)
4	40	24	240
6	60	30	300
10	100	36	360
12	120	40	400
15	150	60	600
20	200		

CHASE ALUM-O-TOP

Made in exactly the same manner as Cop-O-Top (See Page 5, this section), Alum-O-Top is furnished in two and four mil grades (.002 - .004), employing aluminum sheet bonded to heavy crepe kraft paper reinforced with tough glass fiber, about 1/4" spacing in both directions for maximum tear resistance.

Alum-O-Top can be used in all concealed flashing applications. It is widely used for drip caps, sill flashing, waterproofing copings, roof and side wall junctures. Alum-O-Top will never stain or streak stucco construction. Alum-O-Top is the most economical metal flashing available. It is made to compete with some of the less durable flashings which contain no metal.

SPECIFICATIONS

Alum-O-Top: All concealed flashing shall be Alum-O-Top made of aluminum foil, laminated to heavy weight creped kraft paper, impregnated with asphalt and reinforced with glass fiber about every 1/4" in both directions.

WEIGHTS AND CONSTRUCTION

Alum-O-Top: 2 and 4 mil grades (.002 and .004), standard ply or sandwich laminations (kraft paper plus glass fiber - aluminum - kraft paper.)

STANDARD ROLLS - 120 FEET LONG

Standard Widths (Inches)	Area Per Roll (Sq. Feet)	Standard Widths (Inches)	Area Per Roll (Sq. Feet)
4	40	16	160
6	60	24	240
8	80	30	300
10	100	48	480
12	120		



CHASE FASTENERS

This section of the catalog lists a wide range of various Fasteners in Brass, Naval Brass, Silicon Bronze, Silnic Bronze, Stainless Steel, Monel and Aluminum available from Chase Metals Service

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Chase Silnic® Bronze

Silnic Bronze is a Nickel Silicon heat treatable alloy that when heat treated gives physical properties far superior to all other non-ferrous alloys. This is especially true as pertains to the Proof Load of a bolt.

Proof-Load is the maximum load that can be exerted on a bolt, without the bolt suffering permanent stretching or elongation. It is a feeling among the trade that proof-load is actually a more accurate measurement of the qualities of a bolt than tensile strength, since tensile strength is the point at which the bolt will break, whereas proof-load is the point beyond which a bolt will permanently stretch and, therefore, become loose in the installation.

Hex. Head Bolt Average Proof Load in Pounds

	Cold Headed	Cold Headed	Cold Headed	Hot Headed	Hot Headed	Hot Headed
	Silnic	Low Silicon	Naval	Silicon	Naval	Silnic
1/2 x 4	9000	4500	3600	2800	3000	8000

You will find this Chase Silnic Bronze a superior alloy that will more than satisfy your most exacting bolt requirements. Conceivably, in many applications a bolt of the next smaller diameter can be used and still have a higher proof load or resistance to permanent stretch.



BOLTS AND NUTS

BRASS, NAVAL BRASS, SILCON BRONZE, SILNIC BRONZE,
STAINLESS STEEL AND MONEL METAL

A large selection of non-ferrous Bolts and Nuts in all standard types and sizes is available for prompt shipment from stock.

We are also equipped to fill orders promptly for special Bolts and Nuts to a customer's specifications.

Bolts are hot forged or cold headed with either cut or rolled threads.

They are free from burrs, seams, laps, or irregular surfaces that affect service-ability and are manufactured to specifications which meet all commercial standards — such as body diameter and length — thread length — head dimensions as well as dimensions across the flat, thickness, finish, bearing surface of nuts, etc.

Packing

Chase Bolts and Nuts are shipped in bulk or in packages as specified and in a manner to assure satisfactory arrival at destination.

HEXAGON HEAD MACHINE BOLTS

With or Without Nuts

NAVAL BRASS, SILICON BRONZE AND SILNIC BRONZE

Also available in Monel and Stainless Steel from Mill stocks.



Diameters: 1/4" to 3/4", inclusive. Lengths: 1" to 11 1/2", inclusive.

Diameter	Width	Thickness	Diameter	Width	Thickness
Bolt	Head	Head	Bolt	Head	Head
Inches	Inches	Inches	Inches	Inches	Inches
1/4	7/16	5/32	1/2	3/4	5/16
5/16	1/2	13/64	5/8	15/16	25/64
3/8	9/16	15/64	3/4	1 1/8	15/32
7/16	5/8	9/32	7/8	1 5/16	9/16



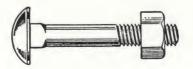
ROUND HEAD SQUARE SHANK BOLTS

With or Without Nuts

SILICON BRONZE, SILNIC BRONZE AND NAVAL BRASS

Also available in Monel and Stainless Steel from Mill stocks.

These are often called Carriage Bolts and are generally used with wood. When the nut is tightened down, the square shank is embedded in the wood, preventing the bolt from turning. The dimensions of the square shank (width and height) equal the diameter of the bolt.



Lengths: 1 1/2" to 12", inclusive

Diameter	Width	Thickness	Diameter	Width	Thickness
Bolt	Head	Head	Bolt	Head	Head
Inches	Inches	Inches	Inches	Inches	Inches
1/4	9/16 $11/16$ $13/16$	1/8	1/2	1 1/16	1/4
5/16		5/32	5/8	1 5/16	5/16
3/8		3/16	3/4	1 9/16	3/8

Many other sizes can be furnished promptly from Mill stocks.

STUD BOLTS



Stud Bolts are used where one end is screwed into a casting or stationary object; a part placed over the end and a nut applied to hold the two pieces together. They are threaded on both ends with a regular bolt thread, or in some cases with a pipe thread, and are furnished with the same or varying diameters on the two ends.

We can supply stud bolts promptly from Mill stocks in Brass, Naval Brass, Silicon Bronze, Monel, Stainless Steel and Silnic Bronze.

Diameters: 1/4" to 1", inclusive. Lengths: 1 1/2" to 6", inclusive.

Longer lengths can be supplied to order.



COACH SCREWS OR LAG BOLTS

SQUARE HEAD-GIMLET POINT

SILICON BRONZE, SILNIC BRONZE AND NAVAL BRASS

Also available in Monel and Stainless Steel from Mill stocks.

Lag Bolts or coach screws are used where a good strong hold in wood is required. They are pointed and similar to wood screws, but in place of a slotted or recessed head the lag bolt has a square head.



Lengths: 1" to 8", inclusive.

Diameter Bolt Inches	Width Head Inches	Thickness Head Inches	Diameter Bolt Inches	Width Head Inches	Thickness Head Inches
1/4	3/8	11/64	1/2	3/4 15/16	21/64 27/64
5/16 3/8	$\frac{1/2}{9/16}$	13/64 1/4	5/8 3/4	1 1/8	1/2

HEXAGON HEAD BRASS CAP SCREWS

U. S. Standard Cut Threads

Also available in Monel and Stainless Steel from Mill stocks.



Lengths: 1/2" to 4 1/2", inclusive

Diameter Bolt Inches	Width Head Inches	Thickness Head Inches	Diameter Bolt Inches	Width Head Inches	Thickness Head Inches
1/4	7/16	5/32	1/2	3/4	5/16
5/16	1/2	13/64	5/8	15/16	25/64
3/8	9/16	15/64	3/4	1 1/8	15/32
7/16	5/8	9/32	7/8	1 5/16	9/16

HANGER BOLTS



Hanger Bolts are similar to Stud Bolts except that one end of the hanger bolt is pointed with a screw thread for securing some part to wood. The other end has a cut thread. They are supplied with hexagon nuts. Available in Naval Brass, Silicon Bronze, Monel and Stainless Steel for prompt shipment from stocks.

Diameters: 3/8" to 3/4", inclusive.

Lengths: 3" to 12", inclusive.

Many other sizes can be furnished promptly from Mill stocks.

SPECIALTIES 11.



AMERICAN STANDARD HEAVY HEXAGON NUTS

BRASS, NAVAL BRASS, SILICON BRONZE AND SILNIC BRONZE





Also available in Monel and Stainless Steel for prompt shipment from Mill stocks.

American Standard Heavy Hexagon Nuts, also called United States Standard (USS) are for use where a greater bearing surface is necessary. Brass nuts are milled in all sizes, cast in sizes 3/8" and larger. Silicon Bronze Nuts are available in sizes up to 1".

Size	Thickness Width in Inches Across			Size	Width Across	Thickness in Inches	
	Flats in Inches	Full Nut	Jam Nut		Flats in Inches	Full Nut	Jam Nut
3/16-24 1/4 -20 5/16-18 3/8 -16 7/16-14	3/8 1/2 9/16 11/16 3/4	11/64 15/64 19/64 23/64 27/64	11/64 13/64 15/64 17/64	1-8 1 1/8-7 1 1/4-7 1 3/8-6 1 1/2-6	1 5/8 1 13/16 2 2 3/16 2 3/8	63/64 1 7/64 1 7/32 1 11/32 1 15/32	35/64 39/64 23/32 25/32 27/32
1/2 -13 9/16-12 5/8 -11 3/4 -10 7/8 -9	7/8 15/16 1 1/16 1 1/4 1 7/16	31/64 35/64 39/64 47/64 55/64	19/64 21/64 23/64 27/64 31/64	1 5/8-5 1/2 1 3/4-5 1 7/8-5 2 - 4 1/2	2 9/16 2 3/4 2 15/16 3 1/8	1 19/32 1 23/32 1 27/32 1 31/32	

AMERICAN STANDARD REGULAR HEXAGON JAM NUTS

BRASS, NAVAL BRASS, SILICON BRONZE AND SILNIC BRONZE





Also available in Monel and Stainless Steel for prompt shipment from Mill stocks.

The American Standard Regular Full Nuts are milled, semi-finished from either Brass, Naval Brass, Silicon Bronze or Silnic Bronze. They are square or hexagon, and are recommended for general use.

1/4 -20 5/16-18	7/16 9/16	13/64 1/4	9/64 11/64	3/4 -10 7/8 -9	1 1/8 1 5/16	41/64 3/4	$\frac{27}{64}$ $\frac{31}{64}$
3/8 - 16 $7/16 - 14$	5/8 3/4	$\frac{5}{16}$ $\frac{23}{64}$	$\frac{13}{64}$ $\frac{15}{64}$	1 -8	1 1/2	55/64	35/64
1/2 -13 9/16-12 5/8 -11	13/16 7/8	27/64 31/64 17/32	19/64 23/64	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1 11/16 1 7/8 2 1/4	31/32 $1 1/16$ $1 9/32$	39/64 23/32



FINISHED HEXAGON NUTS

BRASS, NAVAL BRASS, SILICON BRONZE AND SILNIC BRONZE

Also available in Monel and Stainless Steel for prompt shipment from Mill stocks.





Size	Width Across	Thick	kness	Size	Width Across	Thick	ness
Size	Flats	Full	Jam	Dize	Flats	Full	Jam
1/4 -20 1/4 -28 5/16-18 5/16-24	7/16 $7/16$ $1/2$ $1/2$	7/32 7/32 17/64 17/64	5/32 5/32 3/16 3/16	5/8 -11 5/8 -18 3/4 -10 3/4 -16	15/16 15/16 1 1/8 1 1/8	35/64 35/64 41/64 41/64	3/8 3/8 27/64 27/64
3/8 -16 3/8 -24 7/16-14 7/16-20	9/16 9/16 11/16 11/16	21/64 21/64 3/8 3/8	7/32 7/32 1/4 1/4	7/8 -9 7/8 -14 1 -8 1 -14	1 5/16 1 5/16 1 1/2 1 1/2	3/4 3/4 55/64 55/64	31/64 31/64 35/64 35/64
1/2 -13 1/2 -20 9/16-12 9/16-18	3/4 3/4 7/8 7/8	7/16 7/16 31/64 31/64	5/16 5/16 5/16 5/16	1 1/8-7 1 1/8-12 1 1/4-7 1 1/2-6	1 11/16 1 11/16 1 7/8 2 1/4	31/32 31/32 1 1/16 1 9/32	39/64 39/64 23/32 27/32

AMERIAN STANDARD HEAVY HEXAGON JAM NUTS

BRASS, NAVAL BRASS, SILICON BRONZE AND SILNIC BRONZE

Also available in Monel and Stainless Steel for prompt shipment from Mill stocks.





AMERICAN STANDARD REGULAR HEXAGON JAM NUTS

BRASS, NAVAL BRASS, SILICON BRONZE AND SILNIC BRONZE

Also available in Monel and Stainless Steel for prompt shipment from Mill stocks.



AMERICAN STANDARD LIGHT HEXAGON JAM NUTS

BRASS, NAVAL BRASS, SILICON BRONZE AND SILNIC BRONZE

Also available in Monel and Stainless Steel for prompt shipment from Mill stocks.





Thickness Nut

Inches

5/16

Diameter	Threads	Width	Thickness	Diameter	Threads	Width
Threads	per	Nut	Nut	Threads	per	Nut
Inches	Inch	Inches	Inches	Inches	Inch	Inches
5/16	24 24	$\frac{1}{2}$	$\frac{3}{16}$	1/2	20	3/4

SLOTTED NUTS





Slotted Nuts, sometimes called Castle Nuts, are for use in situations where vibration and rough handling would tend to loosen an ordinary nut. When a slotted nut is used the bolt is drilled and a wire or cotter pin inserted through the slots of the nut and through the hole in the bolt, thereby keeping the nut from backing off. We can supply Brass and other non-ferrous slotted nuts promptly from Mill stocks.

MACHINE SCREW NUTS

BRASS

Also available in Silicon Bronze, Monel, Stainless Steel and Tumbled Nickel finish for prompt shipment from our Mill stocks.

Machine Screw Nuts, also called Stove Bolt Nuts, are furnished either square or hexagon. Hexagon nuts are tapped with either standard or fine threads; the square nuts with standard threads only.

Hexagon machine screw nuts have flat and chamfered tops, the bottoms are flat. Square machine screw nuts are flat without chamber on top and bottom. Brass Machine Screw Nuts are packaged in one-gross boxes, or supplied in bulk.









			Width	Thickness	1			Width	Thickness
	Coarse	Fine	Nut	Nut		Coarse	Fine	Nut	Nut
Size	Thread	Thread	Inches	Inches	Size	Thread	Thread	Inches	Inches
4	40	48	1/4	3/32	12	24	28	7/16	5/32
6	32	40	5/16	7/64	1/4	20	28	7/16	3/16
8	32	36	11/32	1/8	5/16	18	24	9/16	7/32
10	24	32	3/8	1/8	3/8	16	24	5/8	1/4



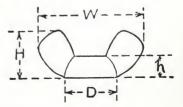
CAP NUTS



Cap Nuts are used where a finished appearance is desired. They have a hexagon base and a rounded top. We can promptly supply Cap Nuts in Brass and other non-ferrous alloys, in $1/4^{\circ}$ to 1" sizes from Mill stocks.

BRASS WING NUTS

Size	Thread	W	Н	D	h
1/4	20	1 1/8	9/16	1/2	7/32
5/16	18	1 7/32	9/16	9/16	1/4
3/8	16	1 7/16	11/16	11/16	5/16
1/2	13	2	15/16	15/16	3/4





BRASS WASHERS



Packed in Bulk or in 1 and 5-pound Boxes

Screw Size	Bolt Size	I.D. Inches	O.D. Inches	Thickness Inches	Number to Pound (Approx.)
No. 2		.092	7/32	.018	6200
No. 3		.105	1/4	.020	4350
	1/8	.140	1/4	.025	3400
No. 4-S	• • •	.119	9/32	.025	2750
No. 4-L	• • •	.128	3/8	.028	1075
No. 5		.133	9/32	.025	2960
No. 6-S		.147	5/16	.028	2100
No. 6-L	1/8	.147	3/8	.032	1160
No. 8-S		.172	3/8	.032	1250
No. 8-L	5/32	.172	7/16	.036	740
No. 10-S		.200	7/16	.036	815
No. 10-L	3/16	.200	1/2	.040	506
No. 12-S	• • •	.227	1/2	.040	540
No. 12-L	7/32	.227	9/16	.040	410
No. 14	1/4	.260	9/16	.040	430
No. 16-S	1/4	.282	5/8	.040	350
No. 16-L	1/4	.282	3/4	.064	138
No. 18	9/32	.310	7/8	.064	98
No. 20-S		.337	3/4	.064	150
No. 20-L	5/16	.337	7/8	.064	103
	3/8	13/32	3/4	.062	164
No. 24-S		. 391	7/8	.064	107
No. 24-L	3/8	. 391	1	.081	63
No. 30	7/16	1/2	1 1/8	.081	52.5
No. 34	1/2 - S	9/16	1 1/4	.091	37.6
	1/2-L	9/16	1 3/8	.091	30.7
	5/8-S	11/16	1 1/2	.102	23.5
	5/8-L	11/16	1 3/4	.102	16
	3/4-S	13/16	1 7/8	.114	13
	3/4-L	13/16	2	. 125	10.2
	7/8	15/16	2 1/4	. 128	7.7
	1	1 1/16	2 1/2	.144	5.6





COPPER WASHERS



Packed in Bulk or 1 and 5-pound Boxes

Bolt Size Inches	I.D. Inches	O.D. Inches	Thickness Inches	Number to Pound (Approx.)
3/16	13/64	9/16	.050	320
3/16	7/32	1/2	.050	350
7/32	.235	5/8	.053	240
1/4	9/32	11/16	.068	150
1/4	9/32	5/8	.065	200
5/16	11/32	3/4	1/16	140
3/8	13/32	1	1/16	72
1/2	9/16	1 3/8	.080	32
5/8	11/16	1 3/4	. 102	16
3/4	13/16	2	. 102	12
7/8	15/16	2 1/4	.114	9
1	1 1/16	2 1/2	.114	7

SILICON BRONZE WASHERS

Packed in Bulk

Bolt Size Inches	I.D. Inches		Thickness Inches					Thickness Inches	
1/4 5/16 3/8 1/2	.260 .366 .395 9/16	9/16 7/8 1 1 1/4	.040 .064 .064	260 104 78 38	5/8 3/4 1	11/16 13/16 1 1/16	1 7/8	.091 .102 .128	26 14 6

Many other sizes can be furnished promptly from Mill stocks.



LOCK WASHERS



ASA Standards-Silicon Bronze

Also available in phosphor bronze, monel and stainless steel for prompt shipment from mill stocks.

Lock Washers are made from flat wire with a spring tension set up, so that under normal conditions any nut, tightened over the washer could not shake loose.

Packed in Bulk

Screw or Bolt Size	Wire Section Width and Thickness In Inches	Screw or Bolt Size	Wire Section Width and Thickness In Inches
No. 4 No. 6 No. 8 No. 10 No. 12 1/4" 5/16"	.040 x .025 .047 x .031 .055 x .040 .062 x .047 .070 x .056 .109 x .062 .125 x .078	3/8" 7/16" 1/2" 5/8" 3/4" 7/8"	.141 x .094 .156 x .109 .171 x .125 .203 x .156 .234 x .188 .266 x .219 .297 x .250

Many other sizes can be furnished promptly from Mill stocks.

We can also supply other types of Special Washers and Stainless Steel Washers promptly from Mill stocks.



BRASS COTTER PINS



EXTENDED PRONG STYLE-FOR GENERAL USE

Cotter Pins are frequently used with loose drilled rivets to prevent the rivet from falling out, and with bolts and nuts to keep the nut from backing off, although there are many applications where the pin is the only fastener in an assembly of two or more parts. All Chase cotter pins are made from corrosion-resistant wire.

Diameter Inches	Length Inches	Standard Package	Weight Pounds per 1000 (Approx.)	Diameter Inches	Length Inches	Standard Package	Weight Pounds per 1000 (Approx.)
1/16	1/2	1000	. 53	5/32	$1 \ 1/2$	500	9.59
1/16	3/4	1000	. 75	5/32	2	500	12.26
1/16	1	1000	1.01	3/16	1	1000	11.09
3/32	1/2	1000	1.44	3/16	1 1/4	500	12.79
3/32	3/4	1000	1.92	3/16	$1 \ 1/2$	500	13.86
3/32	1	1000	2.34	3/16	2	500	18.12
3/32	1 1/8	1000	2.56	3/16	2 1/2	500	22.39
3/32	$1 \ 1/4$	1000	2.77	3/16	3	250	25.58
3/32	$1 \ 1/2$	1000	3.20	1/4	1	500	19.72
1/8	3/4	1000	3.73	1/4	$1 \ 1/4$	500	22.38
1/8	1	1000	4.53	1/4	$1 \ 1/2$	250	25.58
1/8	$1 \ 1/4$	1000	5.33	1/4	2	250	31.98
1/8	$1 \ 1/2$	1000	5.97	1/4	2 1/2	250	37.31
1/8	2	500	7.68	1/4	3	250	42.64
5/32	1	1000	7.25	3/8	3	Bulk	110.
5/32	1 1/4	500	8.31				

Sizes other than listed can be furnished from Mill stocks or made to order.

COTTER PINS

BRASS, COPPER, SILICON BRONZE, PHOSPHOR BRONZE, COMMERCIAL BRONZE, STAINLESS STEEL AND MONEL

In addition to the regular brass cotter pins—extended prong style, for general use—we can supply pins with legs of equal length and the same types in the other alloys listed above, from Mill stocks.

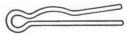
SPECIAL COTTER PINS











Special cotter pins in a wide variety of designs for special applications can be made to order. Included are pins with one or both legs deformed to make them self-spreading and/or self-locking. We shall be glad to quote you on any of your special cotter pin requirements.

SPECIALTIES 17.



REGULAR COPPER WIRE NAILS

FLAT HEAD - DIAMOND POINT



Chase Wire Nails have a flat head and a diamond point, and are recommended for general usage. All Chase Wire and Cut Nails meet Federal Specifications. See Page 19 for Commercial Bronze Wire Nails. We can also supply brass, silicon bronze and stainless steel wire nails promptly from our mill stocks.

Length Inches	Stubs' Gauge	ze Decimal Equivalent Inches	Number to Pound (Approx.)	Length Inches	Size Stubs' Gauge	Decimal Equivalent Inches	Number to Pound (Approx.)
5/8 3/4 3/4 3/4 7/8	No. 16 No. 14 No. 15 No. 16 No. 11	.065 .083 .072 .065	1495 764 1014 1246 319	2 2 2 2 2	No. 8 No. 9 No. 10 No. 11 No. 12	.165 .148 .134 .120	72 90 110 137 166
7/8 7/8 7/8 7/8 1	No. 12 No. 14 No. 15 No. 16 No. 13	.109 .083 .072 .065 .095	379 655 869 1068 437	2 1/4 2 1/4 2 1/2 2 1/2 2 1/2	No. 9 No. 14 No. 8 No. 9 No. 10	.148 .083 .165 .148	80 254 58 72 88
1 1 1/8 1 1/4 1 1/4	No. 14 No. 15 No. 14 No. 11 No. 12	.083 .072 .083 .120	573 761 509 219 265	2 1/2 2 1/2 2 3/4 3 3	No. 11 No. 12 No. 10 No. 8 No. 9	.120 .109 .134 .165	110 133 80 48 60
1 1/4 1 1/4 1 1/4 1 1/2 1 1/2	No. 13 No. 14 No. 15 No. 8 No. 10	.095 .083 .072 .165 .134	350 458 608 97 146	3 3 1/4 3 1/2 3 3/4 4	No. 10 No. 9 No. 8 No. 8	.134 .148 .165 .165 .203	73 55 41 39 24
1 1/2 1 1/2 1 1/2 1 1/2 1 3/4	No. 11 No. 12 No. 13 No. 14 No. 10	.120 .109 .095 .083 .134	183 221 291 382 125	4 4 1/2 5 5 5 6	No. 8 No. 5 No. 4 No. 6 No. 8	.165 .220 .238 .203 .165	36 18 14 19 29
1 3/4 1 3/4	No. 11 No. 12	.120	190	1 0	NO. Z	.201	O

PACKAGING CHASE NAILS

All Chase copper and copper alloy nails are packed in bulk (100 lb. cartons). For special orders they are furnished in 50, 25 and 10 pound boxes, and in 5 and 1 pound paper packages.

Many other sizes can be furnished promptly from Mill stocks.

All Chase wire nails are available in New Silnic Bronze



COMMERCIAL BRONZE WIRE NAILS



For regular copper wire nails, see Page 18. We can also supply brass, silicon bronze, or stainless steel wire nails promptly from Mill stocks.

	Size		Number	1	Size	Size		
		Decimal	to			Decimal	to	
Length	Stubs'	Equivalent	Pound	Length	Stubs'	Equivalent	Pound	
Inches	Gauge	Inches	(Approx.)	Inches	Gauge	Inches	(Approx.)	
3/4	No. 17	.058	1695	2 1/2	No. 10	.134	92	
$1 \ 1/2$	No. 15	.072	526	3	No. 10	.134	76	
2	No. 13	.095	227	3 1/2	No. 10	. 134	66	
2	No. 14	.083	297	4	No. 9	.148	47	
2 1/2	No. 12	. 109	1.38					

FULL BARBED COPPER WIRE NAILS



Chase Full Barbed Copper Wire Nails have a flat head and a diamond point. The barbs break the wood fibres, as the nail is driven, and each fibre acts as an anchor to hold the nail. They are used where greater holding power is necessary.

1 1/4	No. 14	.083	458	2 1/2 3 1/2	No. 10	.134	88
1 1/2	No. 14	.083	382	3 1/2	No. 9	.148	51
1 3/4	No. 14	.083	327	4	No. 9	.148	45
0	37 10	100	1.00	1			

COPPER WIRE SLATING NAILS



Chase Copper Wire Slating Nails (Roofing Nails) have a diamond point and a large flat head, which prevents shingles, slate or sheet metal from pulling over the nail head.

7/8	No. 12	.109	379	1 3/4	No. 11	.120	156
1	No. 10	.134	220	1 3/4	No. 12	.109	190
1	No. 12	.109	332	2	No. 10	.134	110
1 1/4	No. 10	. 134	176	2	No. 11	.120	137
$1 \ 1/4$	No. 11	.120	219	2	No. 12	.109	166
1 1/4	No. 12	.109	265	2 1/4	No. 12	.109	146
1 1/4	No. 14	.083	458	2 1/2	No. 10	.134	88
$1 \ 1/2$	No. 10	.134	146	2 1/2	No. 11	.120	110
1 1/2	No. 11	.120	183	2 1/2	No. 12	.109	133
$1 \ 1/2$	No. 12	.109	221	3	No. 9	.148	60
1 3/4	No. 10	.134	125				



FULL BARBED COPPER SLATING NAILS

	Si	ze	Number		Siz	e	Number
		Decimal	to			Decimal	to
Length Inches	Stubs' Gauge	Equivalent Inches	Pound . (Approx.)	Length Inches	Stubs' Gauge	Equivalent Inches	Pound (Approx.)
1 1/8	No. 12	.109	295 458	1 1/2	No. 12	.109	221

BARBED BRONZE WEATHERSTRIP NAILS

All popular sizes of Barbed Bronze Weatherstrip Nails are available for quick shipment from Mill stocks.

BRASS WIRE BRADS

	3/4	No. 17	.058	1646	1	No. 18	.049	1776
1		No. 16	. 065	944				

SCREEN OR NUMERAL NAILS

Chase Screen or Numeral Nails are furnished from Mill to specifications for marking or dating ties, poles and the like. The smaller sizes are used to mark window screens and the window that each fits.

COPPER STORM NAILS



OCTAGON HEAD

Copper storm nails have a large octagonal head made of No. 22 Stubs' Gauge copper strip that is strong and rigid. The head is also dished so that it will set flat and firmly against the sheathing. The shanks are clenched securely into the center of the heads so they will not break loose.

3/4 No. 14 .083 274 |



REGULAR CUT COPPER NAILS



Chase cut copper nails are stamped from sheet metal, and are used where greater holding power is needed than that given by a wire nail. A cut nail is especially necessary where the wood is constantly expanding and contracting.

Length Inches	DWT	Number to Pound (Approx.)	Length Inches	DWT	Number to Pound (Approx.)
1/2		1636	2	6d	96
3/4		928	2 1/2	8d	58
1	2d	512	3	10d	38
1 1/4	3d	540	3 1/2	16d	32
1 1/2	4d	176	4	20d	24
1 3/4	5d	128	4 1/2	30d	17

CUT COPPER SHEATHING NAILS



Chase cut copper sheathing nails are stamped from a heavier gauge sheet than regular cut nails, have a countersunk head, and are used most widely in boat building to fasten copper sheathing to boat hulls.

1 2d 208 l 1 1/2 4d 120

CUT COPPER CLOUT NAILS



Cut Copper Clout Nails have a flat head and duck bill point. They have the same holding advantages as regular cut nails but are preferred by some trades because of the slender shanks which drive through thin boards easily and the duck bill point which can be bent over (clinched) without splitting the wood after the nail is driven.

1/2		1636	1 1/8		456
5/8		1112	1 1/4	3d	338
3/4		928	1 1/2	4d	220
7/8		644	2	6d	125
1	2d	512			



SPECIAL BARBED NAILS

BRASS - COPPER - COMMERCIAL BRONZE - SILNIC BRONZE

These nails are all manufactured with shanks deformed to give greater holding power than regular plain, ordinary barbed, or cement coated nails in many applications. They are available for prompt shipment from our Mill. Brass Fetter Ring Nails, tin plated, are carried in our Service Center stocks.

All Chase Wire Nails can be furnished with special barbing to insure greater holding power. Information will be furnished upon request. Consult your nearest Chase Metals Service Center.

FETTER RING NAILS



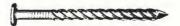
Available in all standard lengths.

HELIX THREAD NAILS



Available in lengths up to and including 5".

SCREW THREAD NAILS



Available in lengths up to and including 5".

BULLDOG SQUARE NAILS



Bulldog nails are measured across the corners; therefore they count approximately 25% more to the pound. The sharp corners tend to cut through wood fibres rather than separate them. Splitting of the wood is less likely when they are used.

Available in lengths up to and including 6".



COPPER GUTTER SPIKES

FLAT HEAD WITH DIAMOND POINT

	Diam	eter	Number		Diam	eter	Number
Length Inches	Inches	Decimal Equivalent Inches	to Pound (Approx.)	Length Inches	Inches	Decimal Equivalent Inches	to Pound (Approx.)
7 7	$\frac{3}{16}$ $\frac{1}{4}$.187 .250	15 8	8	1/4	.250	7
		OVAL	HEAD WIT	TH DIAMO	ND POINT		
7	3/16	.187	15	8	1/4	.250	7
		OVAL	HEAD WI	TH CHISEI	POINT		
7	1/4	.250	8	9	1/4	.250	7
8	1/4	.250	7	10	1/4	.250	6

OVAL HEAD CUT COPPER TACKS



Packed in 1-pound Boxes

Also available in 5-pound boxes or in bulk for prompt shipment from our Mill stocks.

Length Inches	Ounces	Number to Pound (Approx.)	Length Inches	Ounces	Number to Pound (Approx.)
1/4	2	5200	3/4	14	760
3/8	3	2900	7/8	18	570
1/2	6	1650	1	22	420
5/8	10	1000			

FLAT HEAD CUT COPPER TACKS

		In	Buik		
1/4	2	5200	3/4	14	760
3/8	3	2900	7/8	18	570
1/2	6	1650	1	22	420
5/8	10	1000	1		
		Packed in 1-	-pound Boxes*		
1/4	2	5200	3/4	14	760
3/8	3	2900	7/8	18	570
7/16	4	2075	1	22	420
1/2	6	1650	1 1/4	26	280
9/16	8	1280	1 1/2	30	240
5/8	10	1000			
	F	Packed in 1/4-pour	nd Paper Pac	kages*	
3/8	3	2900	1/2	6	1650
7/16	4	2075	9/16	8	1280
	J	Packed in 1/8-pou	nd Paper Pac	kages*	
1/4	2	5200	9/16	8	1280
3/8	3	2900	5/8	10	1000
	4	2075	3/4	14	760
	6	1650	1	22	420
7/16 1/2			3/4		

^{*}Also available from Mill in other weight packages.



CUT ALUMINUM TACKS

FLAT HEAD - IN BULK

Length Inches	Ounces	Number to Pound (Approx.)	Length Inches	Ounces	Number to Pound (Approx.)
3/8 7/16	• •	5940 5532	1/2	• •	5125



BRASS ESCUTCHEON PINS



Packed in 1-pound Boxes

Available in bulk from Mill stocks.

Nickel-plated Escutcheon Pins can also be furnished promptly from Mill stocks-

packed of	r in bulk.						
	Siz	ze	Number		Si	ze	Number
		Decimal	to			Decimal	to
Length	Stubs'	Equivalent	Pound	Length	Stubs'	Equivalent	Pound
Inches	Gauge	Inches	(Approx.)	Inches	Gauge	Inches	(Approx.)
1/4	No. 12	.109	928	5/8	No. 18	.049	2800
1/4	No. 13	.095	1310	5/8	No. 20	.035	5150
1/4	No. 14	.083	1825	3/4	No. 11	.120	350
1/4	No. 15	.072	2475	3/4	No. 12	.109	450
1/4	No. 16	.065	3000	3/4	No. 13	.095	575
1/4	No. 17	.058	3875	3/4	No. 14	.083	735
1/4	No. 18	.049	6300	3/4	No. 15	.072	1010
1/4	No. 19	.042	8000	3/4	No. 16	.065	1215
1/4	No. 20	.035	11680	3/4	No. 17	.058	1630
3/8	No. 10	.134	480	3/4	No. 18	.049	2250
3/8	No. 11	.120	560	3/4	No. 20	.035	4585
3/8	No. 12	.109	735	7/8	No. 12	.109	370
3/8	No. 13	.095	1025	7/8	No. 14	.083	675
3/8	No. 14	.083	1330	7/8	No. 15	.072	910
3/8	No. 15	.072	1650	7/8	No. 16	.065	1150
3/8	No. 16	.065	2200	7/8	No. 17	.058	1350
3/8	No. 17	.058	3075	7/8	No. 18	.049	2000
3/8	No. 18	.049	4200	1	No. 11	.120	275
3/8	No. 19	.042	6100	1	No. 12	.109	320
3/8	No. 20	.035	8200	1	No. 13	.095	450
1/2	No. 11	.120	495	1	No. 14	.083	595
1/2	No. 12	.109	575	1	No. 15	.072	785
1/2	No. 13	.095	800	1	No. 16	.065	925
1/2	No. 14	.083	1100	1	No. 17	.058	1200
1/2	No. 15	.072	1400	1	No. 18	.049	1760
1/2	No. 16	.065	1750	1 1/4	No. 12	.109	270
1/2	No. 17	.058	2400	$1 \ 1/4$	No. 13	.095	370
1/2	No. 18	.049	3300	$1 \ 1/4$	No. 14	.083	480
1/2	No. 19	.042	4775	1 1/4	No. 15	.072	625
1/2	No. 20	.035	6350	1 1/4	No. 16	.065	775
5/8	No. 11	.120	385	1 1/4	No. 17	.058	1000
5/8	No. 12	.109	495	$1 \ 1/2$	No. 12	.109	240
5/8	No. 13	.095	675	1 1/2	No. 14	.083	400
5/8	No. 14	.083	865	1 1/2	No. 15	.072	550
5/8	No. 15	.072	1184	1 1/2	No. 16	.065	670
5/8	No. 16	.065	1500	$1 \ 1/2$	No. 17	.058	875
5/8	No. 17	.058	1850	2	No. 12	.109	160



COPPER AND BRASS RIVETS

Chase Metals Service supplies a full line of copper and brass rivets to fill every need. For information and prices contact your nearest Chase Metals Service Center.



COPPER RIVETS

ROUND HEAD

Packed in Bulk or in 1 and 5-pound Boxes



Diameter Shank Inches	Length Inches	Number to Pound (Approx.)	Diameter Shank Inches	Length Inches	Number to Pound (Approx.)
				3/4	57
3/32	3/16	1600	1/4	7/8	51
1/8	3/16	736	1/4		46
1/8	1/4	572	1/4	$\begin{array}{c} 1 \\ 1 \ 1/4 \end{array}$	40
1/8	5/16	495	1/4		
1/8	3/8	468	1/4	1 1/2	33
1/8	1/2	392	1/4	1 3/4	29
1/8	5/8	306	1/4	2	27
1/8	3/4	270	5/16	1/2	43
1/8	7/8	240	5/16	5/8	37
1/8	1	210	5/16	3/4	33
1/8	1 1/4	154	5/16	7/8	31
1/8	1 1/2	130	5/16	1	29
3/16	1/4	204	5/16	1 1/4	24
3/16	5/16	174	5/16	1 1/2	21
3/16	3/8	166	5/16	1 3/4	19
3/16	1/2	138	5/16	2	16
3/16	5/8	124	3/8	1/2	29
3/16	3/4	110	3/8	5/8	23
3/16	7/8	97	3/8	3/4	21
3/16	1	90	3/8	1	18
3/16	1 1/4	73	3/8	1 1/4	16
3/16	1 1/2	62	3/8	1 1/2	14
3/16	2	51	3/8	2	11
1/4	3/8	81	1/2	1	. 9
1/4	1/2	75	1/2	1 1/2	7
1/4	5/8	67	1/2	2	6

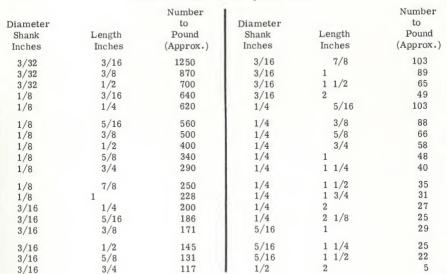




COPPER RIVETS

FLAT HEAD

Packed in Bulk or in 1-pound Boxes



A					7
		COUNTERS	UNK HEAD		
	Packe	d in Bulk or in	1 and 5-pound	Boxes	U
1/8	1/4	680	1/4	7/8	59
1/8	3/8	590	1/4	1	54
1/8	1/2	452	1/4	1 1/4	46
1/8	5/8	372	1/4	1 1/2	39
1/8	3/4	304	1/4	1 3/4	33
1/8	1	237	1/4	2	30
3/16	3/8	212	5/16	3/4	44
3/16	1/2	194	5/16	7/8	40
3/16	5/8	160	5/16	1	36
3/16	3/4	125	5/16	1 1/4	29
3/16	7/8	110	5/16	1 1/2	24
3/16	1	95	5/16	1 3/4	22
3/16	1 1/4	80	5/16	2	19
3/16	1 1/2	67	3/8	1	23
3/16	2	55	3/8	1 1/4	19
1/4	1/2	90	3/8	1 1/2	17

Many other sizes can be furnished promptly from Mill stocks.

3/8

3/8

76

63

2

2 1/2

13

12

1/4

1/4

5/8

3/4





COPPER BRAZIERS' RIVETS



FLAT HEAD

Packed in 5-pound Boxes

Also available in bulk for prompt shipment from Mill stocks.

Copper Braziers' Rivets are made with large flat heads that are built for heavy duty. They are used on large tanks and boilers, where great holding power is necessary.

Diameter Shank	Diameter Head	Length Inches	to Pound (Approx.)	Diameter Shank	Diameter Head	Length Inches	to Pound (Approx.)
1/4 1/4 1/4 1/4	23/32 23/32 23/32 23/32	1/2 5/8 3/4	52 50 48 36	5/16 5/16 5/16 3/8	3/4 3/4 3/4 7/8	1 1 1/4 1 1/2 1	24 21 17 17
1/4 1/4 1/4 5/16	23/32 23/32 23/32 3/4	1 1/4 1 1/2 2 3/4	32 30 22 26	3/8 3/8 3/8 3/8	7/8 7/8 7/8 7/8	1 1/4 1 1/2 1 3/4 2	15 12 11 10



COPPER BRAZIERS' RIVETS



Packed in 5-pound Boxes

Also available for prompt shipment in bulk from Mill stocks.



Size	Diameter	Length	to Pound	Size	Diameter	Length	to Pound
No.	Shank	Inches	(Approx.)	No.	Shank	Inches	(Approx.)
00	11/64	5/16	224	4	11/32	11/16	25
0	3/16	3/8	138	5	23/64	3/4	20
1	1/4	1/2	65	6	25/64	13/16	17
2	9/32	1/2	45	7	7/16	15/16	13
3	19/64	5/8	38	8	17/32	1 1/8	7

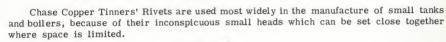


COPPER TINNERS' RIVETS

FLAT HEAD

Packed 1000 to a Box

Also available in bulk for prompt shipment from Mill stocks.



			Number	1			Number
	Diameter	Length	to Pound		Diameter	Length	to Pound
Size	Shank	Inches	(Approx.)	Size	Shank	Inches	(Approx.)
1/2 lb.	.092	5/32	1850	2 1/2 lb.	.148	9/32	375
3/4 lb.	.101	3/16	1250	3 lb.	.160	5/16	300
1 lb.	.115	13/64	850	3 1/2 lb.	.163	21/64	275
1 1/4 1b.	.120	7/32	740	4 lb.	.173	11/32	230
1 1/2 lb.	.125	15/64	650	5 lb.	.186	3/8	180
1 3/4 lb.	.130	1/4	550	6 lb.	.200	25/64	150
2 lb.	. 140	17/64	450				





OVAL HEAD - TAPERED SHANK

Packed in 1-pound Boxes

Also available in bulk for prompt shipment from Mill stocks.

Although they are used most commonly in the manufacture of trunks, Chase copper trunk rivets are also used on leather straps in busses and trolleys, because of their low oval head and great strength. These rivets are packed either with or without burs.

Size	Diameter Under Head	Diameter Tip of Shank	_	Number to Pound (Approx.)	Size No.	Diameter Under Head	Diameter Tip of Shank	Length	Number to Pound (Approx.)
9 9 9	.161 .161 .161	.145 .145 .145 .145	1/4 3/8 1/2 5/8	247 215 178 162	12 12 12 12	.137 .137 .137	.123 .123 .123 .123	1/4 5/16 3/8 1/2	411 379 342 284
9 9 9 9	.161 .161 .161	.145 .145 .145 .145	3/4 7/8 1 1 1/4	141 130 116 98	12 12 12 12	.137 .137 .137 .137	.123 .123 .123 .123	5/8 3/4 7/8	248 219 205 176



COPPER BRAKE BAND RIVETS

COUNTERSUNK HEAD

Packed in 1-pound Boxes

Also available in bulk for prompt shipment from Mill stocks.

Chase copper brake band rivets have a small countersunk head, that can be set flush with the brake band lining, thereby reducing the danger of scoring the brake drum.

Rivet Gauge	Length Inches	Diameter Shank	Number to Pound (Approx.)	Rivet Gauge	Length Inches	Diameter Shank	Number to Pound (Approx.)
No. 4	3/4	.255	48	No. 8	3/4	.165	164
No. 4	1	.255	34	No. 8	7/8	.165	144
No. 5	3/4	.220	97	No. 8	1	.165	128
No. 5	1	.220	75	No. 9	3/8	.148	390
No. 5	2	.220	37	No. 9	1/2	.148	308
No. 6	1/2	.203	152	No. 9	5/8	.148	255
No. 6	5/8	.203	129	No. 9	3/4	.148	211
No. 6	3/4	.203	110	No. 9	7/8	.148	197
No. 6	7/8	.203	95	No. 9	1	.148	168
No. 6	1	.203	86	No. 10	3/8	.134	470
No. 6	1 1/4	.203	56	No. 10	1/2	.134	370
No. 7	3/8	.180	240	No. 10	5/8	.134	315
No. 7	1/2	. 180	196	No. 10	3/4	.134	260
No. 7	5/8	.180	168	No. 10	7/8	.134	235
No. 7	3/4	.180	142	No. 10	1	.134	210
No. 7	7/8	.180	123	No. 10	2	.134	105
No. 7	1	.180	108	No. 12	3/8	.109	710
No. 7	1 1/4	.180	90	No. 12	1/2	.109	560
No. 7	1 1/2	.180	71	No. 12	5/8	.109	480
No. 8	3/8	.165	280	No. 12	3/4	.109	395
No. 8	1/2	.165	226	No. 12	1	.109	300
No. 8	5/8	.165	189				





COPPER BELT RIVETS & BURS

COUNTERSUNK HEAD



Uniform Lengths-Packed in 1-pound Boxes

Also available fro prompt shipment from Mill stocks in 1/2-pound and 1/4-pound boxes.

Chase Copper Belt Rivets have a countersunk head and tapered shank. They are used with burs on harnesses, saddles, belt drives on machinery, etc. We also supply belt rivets without burs, see page 30; and burs only, see page 33.

	Diameter	Diameter		1	Diameter	Diameter	
Size	Under	Tip of	Length	Size	Under	Tip of	Length
No.	Head	Shank	Inches	No.	Head	Shank	Inches
5	.250	.222	3/8	8	.181	.165	$1 \ 3/4$
5	. 250	.222	1/2	8	.181	.165	2
5	.250	. 222	5/8	9	.161	.145	1/4
5	.250	.222	3/4	9	. 161	.145	3/8
5	.250	.222	7/8	9	.161	.145	1/2
5	.250	.222	1	9	.161	.145	5/8
5	. 250	.222	1 1/4	9	.161	.145	3/4
5	.250	.222	1 1/2	9	.161	.145	7/8
5	.250	.222	$1 \ 3/4$	9	.161	.145	1
5	.250	.222	2	9	.161	.145	1 1/8
5	.250	.222	2 1/2	9	.161	.145	1 1/4
6	.228	.205	1/2	9	.161	.145	1 1/2
6	.228	.205	5/8	9	.161	.145	1 3/4
6	.228	.205	3/4	9	.161	.145	2
6	.228	.205	7/8	10	.151	.137	1/4
6	.228	.205	1	10	.151	.137	3/8
6	.228	.205	1 1/4	10	.151	.137	1/2
6	.228	.205	$1 \ 1/2$	10	.151	.137	5/8
6	.228	.205	$1 \ 3/4$	10	.151	.137	3/4
6	.228	.205	2	10	.151	.137	7/8
6	.228	.205	2 1/2	10	.151	.137	1
7	.191	.175	3/8	10	. 151	.137	1 1/4
7	.191	.175	1/2	10	.151	.137	1 1/2
7	.191	.175	5/8	10	.151	.137	2
7	. 191	.175	3/4	11	.141	.127	3/4
7	.191	.175	7/8	11	.141	.127	1
7	. 191	.175	1	12	.137	.123	1/4
7	. 191	.175	1 1/8	12	.137	.123	3/8
7	. 191	.175	1 1/4	12	.137	.123	1/2
7	. 191	.175	1 1/2	12	.137	.123	5/8
7	.191	.175	1 3/4	12	.137	.123	3/4
7	. 191	.175	2	12	.137	.123	7/8
7	.191	.175	2 1/4	12	.137	.123	1
7	.191	.175	2 1/2	12	.137	. 123	1 1/8
8	.181	.165	1/4	12	.137	.123	1 1/4
8	.181	.165	3/8	12	.137	. 123	1 1/2
8	.181	.165	1/2	13	.118	.105	5/16
8	.181	.165	5/8	13	.118	.105	3/8
8	.181	.165	3/4	13	.118	.105	1/2
8	.181	.165	7/8	13	.118	.105	3/4
8	.181	.165	1	14	.102	.092	1/4
8	.181	.165	1 1/8	14	.102	.092	3/8
8	.181	.165	1 1/4	14	.102	.092	1/2
8	.181	.165	$1 \ 1/2$	1			

Continued





COPPER BELT RIVETS & BURS

COUNTERSUNK HEAD

Uniform Lengths-Packed in 1-pound Boxes



Continued

	Diameter	Diameter		1	Diameter	Diameter	
Size	Under	Tip of	Length	Size	Under	Tip of	Length
No.	Head	Shank	Inches	No.	Head	Shank	Inches
14	.102	.092	5/8	15	.090	.085	1/2
14	.102	.092	3/4	15	.090	.085	5/8
14	.102	.092	7/8	15	.090	.085	3/4
14	.102	.092	1	15	.090	.085	1
15	090	085	3/8				



COPPER BELT RIVETS

COUNTERSUNK HEAD

Uniform Lengths-Packed in 1-pound Boxes



Also available for prompt shipment from Mill in 1/2-pound and 1/4-pound Boxes, or in bulk. For copper belt rivets packaged with burs, see Page 29. For burs only, see Page 33.

Size No.	Diameter Under Head	Diameter Tip of Shank	Length Inches	Number to Pound (Approx.)	Size No.	Diameter Under Head	Diameter Tip of Shank	Length	Number to Pound (Approx.)
8 8 8 8	. 181 . 181 . 181 . 181 . 181	.165 .165 .165 .165	3/8 1/2 5/8 3/4 7/8	206 180 150 133 120	10 10 10 11 12	.151 .151 .151 .141 .137	.137 .137 .137 .127 .123	1 1 1/4 1 1/2 3/4 1/4	147 121 104 215 525
8 8 8 8	.181 .181 .181 .181	.165 .165 .165 .165	1 1 1/8 1 1/4 1 1/2 1 3/4	105 94 86 75 64	12 12 12 12 12	.137 .137 .137 .137 .137	.123 .123 .123 .123 .123	5/16 3/8 1/2 5/8 3/4	472 412 330 287 244
8 9 9 9	.181 .161 .161 .161	.165 .145 .145 .145 .145	2 1/4 3/8 1/2 5/8	53 313 260 208 183	12 12 13 13 13	.137 .137 .118 .118	.123 .123 .105 .105	7/8 1 3/8 1/2 5/8	212 191 510 420 360
9 9 9 9	.161 .161 .161 .161	.145 .145 .145 .145 .145	3/4 7/8 1 1 1/4 1 1/2	160 143 129 108 93	13 14 14 14 14	.118 .102 .102 .102 .102	.105 .092 .092 .092 .092	1 1/4 3/8 1/2 5/8	250 871 702 579 490
10 10 10 10 10	.151 .151 .151 .151 .151	.137 .137 .137 .137 .137	1/4 3/8 1/2 5/8 3/4 7/8	386 302 256 216 192 165	14 14 15 15 15	.102 .102 .090 .090	.092 .092 .085 .085	$ \begin{array}{r} 3/4 \\ 1 \\ 1/4 \\ 1/2 \\ 1 \end{array} $	435 336 1263 755 420

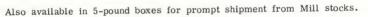




BRASS RIVETS

ROUND HEAD

Packed in Bulk or 1-pound Boxes



Round and countersunk head brass rivets are used to take the place of bolts and nuts or screws on a permanent job. Rough handling and vibration will not loosen them.

Diameter Shank	Diameter Head	Length Inches	Number to Pound (Approx.)	Diameter Shank	Diameter Head	Length Inches	Number to Pound (Approx.)
1/16	7/64	1/8	4465	3/16	21/64	3/8	171
1/16	7/64	3/16	3427	3/16	21/64	7/16	156
1/16	7/64	1/4	2694	3/16	21/64	1/2	141
1/16	7/64	5/16	1961	3/16	21/64	5/8	127
1/16	7/64	3/8	2316	3/16	21/64	3/4	118
3/32	5/32	3/16	1316	3/16	21/64	7/8	103
3/32	5/32	1/4	1158	3/16	21/64	1	85
3/32	5/32	3/8	816	3/16	21/64	$1 \ 1/4$	77
1/8	7/32	1/8	928	3/16	21/64	$1 \ 1/2$	67
1/8	7/32	3/16	742	1/4	7/16	3/8	93
1/8	7/32	1/4	644	1/4	7/16	1/2	77
1/8	7/32	5/16	546	1/4	7/16	5/8	65
1/8	7/32	3/8	480	1/4	7/16	3/4	60
1/8	7/32	1/2	414	1/4	7/16	7/8	54
1/8	7/32	5/8	352	1/4	7/16	1	47
1/8	7/32	3/4	300	1/4	7/16	1 1/4	39
1/8	7/32	1	223	1/4	7/16	$1 \ 1/2$	34
3/16	21/64	1/4	206	1/4	7/16	2	28
3/16	21/64	5/16	189	1/4	7/16	$2 \ 3/4$	22



BRASS RIVETS

COUNTERSUNK HEAD

Packed in Bulk or 1-pound Boxes

1/8	7/32	1/4	842	3/16	21/64	1 1/4	
1/8	7/32	3/8	622	3/16	21/64	1 3/8	
1/8	7/32	1/2	460	1/4	7/16	3/4	
3/16	21/64	1/2	185	1/4	7/16	$1 \ 1/4$	
3/16	21/64	5/8	168	1/4	7/16	$1 \ 1/2$	
3/16	21/64	3/4	149	1/4	7/16	2	
3/16	21/64	1	113				



Many other sizes can be furnished promptly from Mill stocks.





BRASS RIVETS

FLAT HEAD

Packed in 1-pound Boxes

Also available in bulk for prompt shipment from Mill stocks.

Diameter Shank	Diameter Head	Length Inches	Number to Pound (Approx.)		Diameter Head	Length Inches	Number to Pound (Approx.)
3/32	3/16	3/8	916	3/16	3/8	2	52



BRASS TUBULAR RIVETS

COUNTERSUNK HEAD

Packed 1000 to a Box

Also available in bulk or cartons of 12/100 for prompt shipment from Mill stocks.

Chase Brass tubular and semi-tubular rivets are widely used for fastening friction material to brake shoes, brake bands, clutch facings and transmissions. They packaged 1000 to a box.

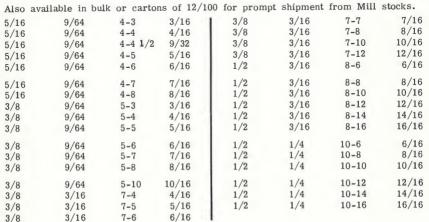
Specifications				Specific	cations		
Diameter Head	Diameter Shank	Standard Number	Length Inches	Diameter Head	Diameter Shank	Standard Number	Length Inches
5/16	9/64	3-3	3/16	5/16	9/64	3-7	7/16
5/16	9/64	3-4	4/16	5/16	9/64	3-8	8/16
5/16	9/64	3-5	5/16	5/16	9/64	3-10	10/16
5/16	9/64	3-6	6/16				



SEMI-TUBULAR BRASS RIVETS

COUNTERSUNK HEAD

Packed 1000 to a Box



Many other sizes can be furnished promptly from Mill stocks.







































































COPPER BURS ONLY

Packed in 1-pound Boxes





				to					to
Size	O.D.	I.D.	Thickness	Pound	Size	O.D.	I.D.	Thickness	Pound
No.	Inches	Inches	Inches	(Approx.)	No.	Inches	Inches	Inches	(Approx.)
3	. 922	.290	.081	64	10	.406	.138	.036	750
4	.875	.256	.071	76	11	.391	.128	.031	950
5	.813	.223	.064	102	12	.360	.124	.028	1240
6	. 656	.206	.057	184	13	.344	.106	.025	1350
7	. 500	.176	.051	380	14	.313	.093	.022	2050
8	.469	.166	.045	465	15	.281	.086	.020	2950
9	.438	.146	.040	580	16	.250	.067	.018	3825

CHASE INDUSTRIAL RIVETS

FULL TUBULAR, SEMI-TUBULAR AND SPLIT BRASS, COPPER, STEEL, STAINLESS STEEL AND ALUMINUM

Chase Industrial Rivets are used widely on harness, straps, leather, canvas, pocket-book frames, electric appliances, etc. We can supply them on direct Mill shipments in all standard styles, diameters and lengths. Orders for Industrial Rivets must be for a minimum of 10,000 of a size per item.

Special Finishes for Industrial Rivets

Chase Industrial Tubular and Split Rivets can be supplied in the following finishes: Tinned, Coppered, Brass Plated, Chromium Plated, Parkerized, Cadmium Plated, Nickeled, Electro-Galvanized, Black Japanned, Oxidized, Bronzed, Gun Metal, Black Japan over Parkerizing, or Japan in color.



INSECT WIRE SCREENING



Chase Bronze and Chase Alclad Aluminum Insect Wire Screening are quality products. They are both excellent corrosion-resistant metals for use in window, door, porch, patio and cabana screens. Chase Insect Screening is carefully woven so all openings are uniform, and each wire is double crimped to keep the mesh firm and accurate. Chase Insect Wire Screening complies with all the requirements of Commercial Standard CS-138-55 as developed by the industry under the procedure of the National Bureau of Standards and issued by the United States Department of Commerce. Each roll is packaged in a strong, attractive hexagonal cardboard carton which minimizes the danger of denting in transit. The hexagonal shape also prevents rolling and the cartons are more easily stored.

CHASE BRONZE INSECT WIRE SCREENING

BRIGHT OR ANTIQUE FINISH -. 011" Dia. Wire

In Rolls of 100 Lineal Feet

	Width	I.	Width	Î.	Width
Mesh	Inches	Mesh	Inches	Mesh	Inches
18 x 14	18	18 x 14	28	18 x 14	40
18 x 14	20	18 x 14	29	18 x 14	42
18 x 14	21	18 x 14	30	18 x 14	44
18 x 14	22	18 x 14	31	18 x 14	46
18 x 14	23	18 x 14	32	18 x 14	48
18 x 14	24	18 x 14	33	18 x 14	54
18 x 14	25	18 x 14	34	18 x 14	60
18 x 14	26	18 x 14	36	18 x 14	72
18 x 14	27	18 x 14	38	1	





CHASE ALCLAD ALUMINUM INSECT WIRE SCREENING

.011" Diameter Wire

NEW EXTRA FINE MESH

In Rolls of 100 Lineal Feet

Mesh	Width Inches	Mesh	Width Inches	Mesh	Width Inches
18 x 16	16	18 x 16	27	18 x 16	38
18 x 16	18	18 x 16	28	18 x 16	40
18 x 16	20	18 x 16	29	18 x 16	42
18 x 16	21	18 x 16	30	18 x 16	44
18 x 16	22	18 x 16	31	18 x 16	46
18 x 16	23	18 x 16	32	18 x 16	48
18 x 16	24	18 x 16	33	18 x 16	54
18 x 16	25	18 x 16	34	18 x 16	60
18 x 16	26	18 x 16	36	18 x 16	72

CHASE GALVANIQUE INSECT WIRE SCREENING

.011" Diameter Wire

In Rolls of 100 Lineal Feet

Mesh	Width Inches	Mesh	Width Inches	Mesh	Inches
18 x 14	18	18 x 14	26	18 x 14	34
18 x 14	19	18 x 14	27	18 x 14	36
18 x 14	20	18 x 14	28	18 x 14	40
18 x 14	21	18 x 14	29	18 x 14	42
18 x 14	22	18 x 14	30	18 x 14	44
18 x 14	23	18 x 14	31	18 x 14	46
18 x 14	24	18 x 14	32	18 x 14	48
18 x 14	25	18 x 14	33		

CHASE TYPE 316 STAINLESS STEEL INSECT WIRE SCREENING

.009" Diameter Wire

In Rolls of 100 Lineal Feet

Available for prompt shipment from Mill

Mesh	Width Inches	Mesh	Width Inches	Mesh	Width Inches
18 x 18	24	18 x 18	30	18 x 18	36
18 x 18	26	18 x 18	32	18 x 18	42
18 x 18	28	18 x 18	34	18 x 18	48

Copper Insect Wire Screening

Copper Insect Wire Screening is considered a special item and is not stocked by Chase Metals Service Centers; however it is available on order in 16 x 16 mesh, .015" diameter wire.



CHASE INDUSTRIAL WIRE CLOTH

Chase Industrial Wire Cloth is used in mechanical separation, evaporation, drying, screening, sifting and refining operations. The mesh is uniform, and the wires are double crimped, which helps to keep all openings square and true.

Copper is frequently selected for exposed guards and strainers and Brass or Bronze Wire Cloth for industrial equipment because of their strength and corrosion resistance.

Low Brass, Copper and Aluminum Industrial Wire Cloth in 36" widths is carried in stock. Industrial Wire Cloth in Commercial Bronze 90%, Phosphor Bronze, Monel, Nickel and Stainless Steel can also be supplied promptly from Mill stocks. Many other meshes, in addition to those listed below, can be supplied promptly from Mill.

LOW BRASS

Mesh	Diameter of Wire In Inches	In 100-foot Rolls Width Opening Inches	s-36 inches W	Diameter of Wire In Inches	Width Opening Inches
				.0135	.028
2 x 2	.063	.437	24 x 24		
4 x 4	.047	.203	30 x 30	.012	.021
6 x 6	.035	. 132	40 x 40	.010	.015
8 x 8	.028	.097	40 x 33	.010	$.015 \times .021$
10 x 10	.025	.075	50 x 50	.009	.011
12 x 12	.023	.060	50 x 40	.009	.011 x .016
14 x 14	.020	.051	60 x 60	.0075	.009
16 x 16	.018	.045	60 x 50	.0075	$.009 \times .013$
18 x 18	.017	.039	80 x 67	.0055	.007 x .0095
20 x 20	.016	.034	100 x 84	.0045	.006 x .0074

In 100-foot Rolls-Other Widths

Mesh	Width In Inches	Diameter of Wire In Inches	Width Opening Inches		Width In Inches	Diameter of Wire In Inches	Width Opening Inches
2 x 2	24 48	.063	.437	4 x 4	48	.047	.203

COPPER

In 100-foot Rolls-36 inches Wide

Mesh	Diameter of Wire In Inches	Width Opening Inches	Mesh	Diameter of Wire In Inches	Width Opening Inches
Mesii	In menes	niches	Mesi	In menes	Inches
2 x 2	.063	.437	20 x 20	.016	.034
4 x 4	.047	.203	24 x 24	.0135	.028
6 x 6	.035	.132	30 x 30	.012	.021
8 x 8	.028	.097	40 x 33	.010	$.015 \times .021$
16 x 16	.018	.045	50 x 40	.009	.011 x .016
18 x 18	.017	.039	60 x 50	.0075	.009 x .013

In 100-foot Rolls-Other Widths

Mesh	Width In Inches	Diameter of Wire In Inches	Width Opening Inches	Mesh	Width In Inches	Diameter of Wire In Inches	Width Opening Inches
2 x 2	24	.063	.437	4 x 4	24	.047	.203
2 x 2	30	.063	.437	4 x 4	30	.047	.203
2 x 2	48	.063	.437	4 x 4	48	.047	.203



INDUSTRIAL WIRE CLOTH

ALUMINUM

In 100-foot Rolls

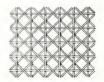
	Width	Diameter of Wire	Width Opening		Width	Diameter of Wire	Width Opening
Mesh	In Inches	In Inches	Inches		In Inches	In Inches	Inches
2 x 2	36	.063	.437	4 x 4	36	.047	.203



GRILLE CLOTH

BRONZE OR ALUMINUM

In 40-foot Rolls



Chase Grille Cloth, available in Bronze or Aluminum, is durable for outdoor use. It makes an excellent screen door guard because of its sturdiness, light weight, and large open area. It cuts easily with tin snips, and even when cut into small pieces, will not unrayel.

TYPE 50A Aluminum
TYPE 50B Bronze

BRASS STRAINER CLOTH

The wire cloth listed below is known commercially as Strainer Cloth. It is used for straining applications that do not require the accurate weave or strength of wire that is characteristic of the Market Grades of Chase Wire Cloth, listed on previous pages. It is used widely in the dairy and processing industries.

Mesh		Mesh		Mesh	
No. of	Standard	No. of	Standard	No. of	Standard
Holes	Size of	Holes	Size of	Holes	Size of
per Inch	Roll	per Inch	Roll	per Inch	Roll
30 x 26	12" x 60"	50 x 36	36" x 100"	80 x 55	36" x 100"
40 x 32	12" x 60"	60 x 40	12" x 60"	100 x 69	12" x 60"
40 x 32	36" x 100"	60 x 40	36" x 100"	100 x 69	36" x 100"
50 × 36	1211 - 6011	80 x 55	12" * 60"		

Other meshes can be supplied promptly from Mill stocks.

PERFORATED METAL



Chase Metals Service is headquarters for perforated metal of every description, such as used in juice strainers, filter press plates, cotton seed oil mills, well points, oil burners, and in various types of equipment in pulp and paper mills, breweries, distilleries, refineries, etc. In ordering, state size and gauge of sheet, alloy, size and shape of perforation, number of perforations per square inch, and whether with or without margins. Prompt delivery from mills.

SPECIALTIES 37.



CONTINUOUS CAST BRONZE For Bearings, Bushings and Parts

Lengths up to 105 inches

SAE 660

NOMINAL COMPOSITION

Copper	8.3%	Lead	7%
Tin	7%	Zinc	3%

Continuous Cast Bearing Bronze is produced fundamentally by vertical casting. Molten metal, of the proper alloy, enters a die of the desired size. In its course through the die, it is solidified. Further in the line, the bar is cut off to the desired length, up to 105 inches. Each bar is then inspected and straightened.

This process has many inherent values. Naturally, we start with a high grade alloy (SAE 660), made from ingot. From this manufacturing process are produced bronze bars with a uniform, high density structure. Each bar is free from inclusions, blow holes, or undersurface defects. The 105-inch length makes it ideal for screw machine production of finished parts.

The uniform high quality of Chase Continuous Cast Bearing Bronze assures you of long, smooth, quiet bearing performance, cutting replacement to a minimum. It is ideal for new equipment or for replacement in your operating machines. Try Chase Continuous Cast Bearing Bronze on your next application. Prove to yourself that you cannot buy a better bronze for bearings, bushings, or parts.

Tolerances

Solid Bars: Nominal size plus 1/32" on the O.D.

Cored Bars: Nominal size I.D. minus 1/32"
O.D. nominal size plus 1/32"

SOLID ROUND BARS

Lengths: 26 1/4", 52 1/2", 105"



Dia. Inches	Weight Lbs. per Lin. Ft. (Approx.)	Dia. Inches	Weight Lbs. per Lin. Ft. (Approx.)	Dia. Inches	Weight Lbs. per Lin. Ft. (Approx.)
1/2	.85	1 3/8	5.9	2 1/4	15.7
5/8	1.30	1 1/2	7.1	2 3/8	17.4
3/4 7/8	1.85 2.5 3.2	1 5/8 1 3/4 1 7/8	8.3 9.6 10.9	2 1/2 2 5/8 2 3/4	19.3 21.3 23.4
1 1/8	4.0	2	12.4	2 7/8	25.5
1 1/4		2 1/8	14.0	3	27.8



CONTINUOUS CAST BRONZE For Bearings, Bushings and Parts

Lengths up to 105 inches

SAE 660

CORED BARS

Lengths: 26 1/4", 52 1/2", 105"



I.D. Inches	O.D. Inches	Weight Lbs. per Lin. Ft. (Approx.)	I.D. Inches	O.D. Inches	Weight Lbs. per Lin. Ft. (Approx.)	I.D.	O.D.	Weight Lbs. per Lin. Ft. (Approx.)	
1/2 1/2 1/2 1/2 1/2 1/2	1 1 1/8 1 1/4 1 3/8 1 1/2	2.6 3.4 4.3 5.3 6.5	1 1 1 1 1	2 1/4 2 3/8 2 1/2 2 3/4 3	12.8 14.6 16.4 20.5 25.0	1 1/2 1 1/2 1 1/2 1 5/8 1 5/8	2 5/8 2 3/4 3 2 1/8 2 1/4	14.9 16.9 21.5 6.4 8.1	
1/2 1/2 5/8 5/8 5/8	1 3/4 2 1 1/8 1 1/4 1 3/8	8.9 11.7 3.0 3.9 4.9	1 1/8 1 1/8 1 1/8 1 1/8 1 1/8	1 5/8 1 3/4 1 7/8 2 2 1/8	4.7 6.0 7.4 8.9 10.4	1 5/8 1 5/8 1 5/8 1 5/8 1 5/8	2 3/8 2 1/2 2 5/8 2 3/4 3	9.8 11.7 13.7 15.7 20.3	
5/8 5/8 5/8 5/8 5/8	1 1/2 1 5/8 1 3/4 2 2 1/8	6.0 7.2 8.5 11.4 13.0	1 1/8 1 1/8 1 1/8 1 1/8 1 1/8	2 1/4 2 3/8 2 1/2 2 3/4 2 7/8	12.1 13.8 15.7 19.8 22.0	1 3/4 1 3/4 1 3/4 1 3/4 1 3/4	2 1/4 2 3/8 2 1/2 2 5/8 2 3/4	6.8 8.6 10.5 12.6 14.6	
3/4 3/4 3/4 3/4 3/4	1 1/4 1 3/8 1 1/2 1 5/8 1 3/4	3.4 4.5 5.6 6.7 8.0	1 1/4 1 1/4 1 1/4 1 1/4 1 1/4	1 3/4 1 7/8 2 2 1/8 2 1/4	5.2 6.6 8.1 9.6 11.3	1 3/4 1 3/4 1 7/8 1 7/8 1 7/8	2 7/8 3 2 3/8 2 1/2 2 5/8	16.8 19.1 7.3 9.2 11.2	
3/4 3/4 3/4 3/4 3/4	1 7/8 2 2 1/8 2 1/4 2 1/2	9.4 10.9 12.4 14.1 17.8	1 1/4 1 1/4 1 1/4 1 1/4 1 1/4	2 3/8 2 1/2 2 5/8 2 3/4 2 7/8	13.0 14.9 16.8 18.8 21.0	1 7/8 1 7/8 1 7/8 2 2	2 3/4 2 7/8 3 2 1/2 2 5/8	13.2 15.5 17.8 7.7 9.8	
3/4 7/8 7/8 7/8 7/8	2 3/4 1 3/8 1 1/2 1 5/8 1 3/4	21.7 3.9 5.0 6.2 7.5	1 1/4 1 3/8 1 3/8 1 3/8 1 3/8	3 1 7/8 2 2 1/8 2 1/4	23.4 5.6 7.0 8.6 10.3	2 2 2 2 1/8 2 1/8	2 3/4 2 7/8 3 2 5/8 2 3/4	11.8 14.0 16.3 8.2 10.2	
7/8 7/8 7/8 7/8 7/8	1 7/8 2 2 1/8 2 1/4 1 1/2	8.8 10.3 11.8 13.5 4.3	1 3/8 1 3/8 1 3/8 1 3/8 1 3/8	2 3/8 2 1/2 2 5/8 2 3/4 3	12.1 13.9 15.8 17.9 22.4	2 1/8 2 1/8 2 1/4 2 1/4 2 1/4	2 7/8 3 2 3/4 2 7/8 3	12.5 14.8 8.6 10.8 13.1	
1 1 1 1	1 5/8 1 3/4 1 7/8 2 2 1/8	5.5 6.8 8.2 9.7	1 1/2 1 1/2 1 1/2 1 1/2 1 1/2	2 2 1/8 2 1/4 2 3/8 2 1/2	6.0 7.5 9.1 10.9	2 3/8 2 3/8 2 1/2	2 7/8 3 3	9.1 11.4 9.7	

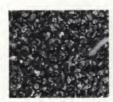


BRASS SPELTER SOLDER

Brass Spelter Solder is used for brazing Brass and Steel tubes, barrels, tanks, automobile parts and accessories, buttons, for coppersmithing and marine equipment. No definite rules can be made with regard to proportions for various uses or alloys as different persons follow different methods. The grade or grain of spelter solder best suited to any particular purpose is determined largely by experience.



No. 10 Med. Gray Quick Running



No. 12 Fine Grain Gray



No. 20 Coarse Long Grain



No. 21 Medium Long Grain



No. 22 Fine Long Grain



No. 23 Extra Fine Long Grain



No. 24 Coarse Round Grain



No. 25 Fine Round Grain



No. 26 Extra Fine Round Grain



No. 41 Fine Round Grain

PROPERTIES	OF	BRASS	SPELTER	SOLDER
PROPERTIES	Or	DIABB	SPELIER	SOLDER

				Liqu	ids	Soli	idus
Number	Grain	Size	Color	°C.	°F.	°C.	°F.
20	Long	Medium Fine	Yellow	882	1620	868	1595
22	Long	Fine	Yellow	882	1620	868	1595
51	Round	Fine	Yellow	882	1620	869	1600
60	Round	Super Fine	Gray	813	1495	782	1440
61	Round	Fine	Gray	813	1495	782	1440





SILVER SOLDER

Chase Silver Solder is available in all standard alloys for prompt shipment from the mills. It is a general-purpose silver brazing alloy for low-temperature brazing. Available in strip, packed in one-ounce (Troy Weight) metal containers, or in wire form.

OLYMPIC (SILICON) BRONZE WELDING FLUX

In 1-pound Cans

SOLDERING COPPERS

When ordering, always refer to soldering coppers by weight per pair. One piece will be furnished when 1/2 pair is specified. Always specify type or pattern.





The Pointed Pattern seems to be the preferred soldering copper for all around work, because the point will reach many parts to be soldered, that would be hard to get at with any other pattern.

SIZES: 1, 1 1/2, 2, 2 1/2, 3, 4, 5, 6, 8, and 10 pounds per pair.

Hatchet Pattern Rigid Handle



The Hatchet pattern of soldering copper is used primarily by manufacturers of special cans and tanks where seams cannot be conveniently soldered with straight type coppers. With this type inside vertical and horizontal seams can be quickly soldered.

SIZES: 3, 4, 5, 6 and 8 pounds per pair.

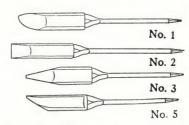
Flat Bottom



Flat Bottom soldering coppers are wedgeshaped to give greater concentration over a larger surface area. They are used primarily for tinning operations.

SIZES: 6 pounds per pair.

Special Gas Meter



Special Gas Meter soldering coppers are preformed for specific opening, closing, and tinning operations on gas meter boxes. Available for prompt shipment from mill.

No.	Weight Lbs. Per Pair	Application
1	5	Installing discs on dia-
		phragm rings
2	5	Installing fronts and backs
3	6	Tinning meter bodies and
		flanges
4	5	Same as Style No. 3, ex-
		cept wide pt.
5	5	Installing diaphragms.
		SPECIALTIES 41.

COPPER SHOT ALLOY



Copper Shot Alloy is available in the following grades:

No. 1 Foundry (99.00% plus copper content)
Intermediate (99.50% plus copper content)
(99.75% plus copper content)

Pellet sizes available are:

1/4" down to Birdseed 1/4" minimum to larger

3/16" down to 1/8" 1/8" down to Birdseed

1/16" down to Birdseed

Fine, plished shot can be supplied for the jewelry industry, which is specially treated to insure freedom from sulphur and oxygen. It is practically chemically pure copper. All shot will be furnished in this grade, 3 mesh and down, unless specifically ordered otherwise.

Pellet sizes available are:

3 mesh and down 4 mesh and down 6 mesh and down 10 mesh and down

COPPER HAMMERS

Copper Hammers are used mainly in places where it is necessary to use every precaution against fire, such as may be caused from sparks by striking steel against steel, or iron against iron. Copper is less susceptible to sparking and is for use around oil and gasoline storage tanks, in oil fields, on steamships, in garages; in fact in any place where the fire hazard is high.



Pure copper hammers are available in the following sizes: 1/2, 1, 1 1/2, 2, 3, 4, 5, 6,8 and 10 pounds each without handles. These hammers take the same type of handle as a steel nail hammer.

GENERAL DATA

See Next Page
For Index



CHASE METALS SERVICE

GENERAL DATA INDEX

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ALUMINUM, BRASS, COPPER AND STAINLESS

To assist you in making out your orders, to reduce correspondence, and to eliminate unnecessary delays and possible errors, here are 14 points which should be included in every order for aluminum, brass, copper or stainless products, to have it filled promptly.

1. QUANTITY, TOTAL

Order in units such as pounds, pieces, total feet.

2. ALLOY

Give name, alloy grade or type, or nominal composition.

3. CROSS SECTION

Designate shape such as round, hexogonal, square, rectangular, etc.

4. PRODUCTS

Mention form, such as sheet, strip, plate, bar, rod, shape, wire, pipe, tube.

5. NOMINAL DIMENSIONS

Give the dimensions such as width, thickness, length, distance across the flats, diameter (O.D. or I.D. for tube), wall thickness, type of water tube or pipe and standard pipe size. Use decimals instead of gauge numbers.

6. HOW FURNISHED

Specify how the material is to be furnished, such as straight lengths, rolls or coils.

HOW TO ORDER

(Continued)

7. LENGTH CLASSIFICATION

Give length classification, such as specific, specific with ends, random mill, or multiple, etc.

8. DIMENSIONAL TOLERANCES

Published schedules will apply unless special values are stated.

9. TEMPER

Give the temper, in terms of grain size, tensile strength or nominal temper; or order to standard industry designation; i.e.: aluminum standard temper designation, Rockwell Hardness, or to mechanical properties specifications.

10. FINISH OR CONDITION

For brass, bronze and copper products, give the finish, if other than commercial. For aluminum, specify the particular finish, such as cold-drawn rod, mill finish sheet. For stainless flat-rolled products, specify finish as #2B, #3, etc., and whether finish is for one side or both. For stainless bars, specify "hot-rolled" or "cold-drawn", etc.; pipe and tubing, "as welded", "as drawn", pickled, polished, etc.

11. SPECIFICATIONS

Include the specifications, if any, such as ASTM, ASA, SAE, Government.

12. PACKAGING INSTRUCTIONS;

Give packaging instructions, such as: on skids, in boxes, in bulk, paper-wrapped, interleaved, adhesive paper protected, etc.

13. SHIPPING DATE AND INSTRUCTIONS

Give requested date stating whether or not material would be accepted before that date. Where a definite routing is preferred, specify it on the order.

14. SPECIAL INFORMATION

Special information listing subsequent fabricating operations as swaging, drawing, machining, polishing or plating. Service to which the end product is to be put. Need for special properties such as resistance to wear or corrosion. Submit samples or drawings.



BRASS - COPPER - BRONZE

DEFINITIONS AND SUGGESTIONS FOR SELECTION AND USE

FORM

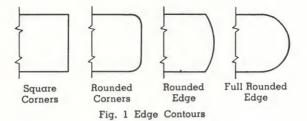
The following definitions are in accord with those published by the Copper & Brass Research Association.

"BAR"—A solid rectangular or square section, or one with two plane parallel surfaces and round or other simple regularly shaped edges, up to and including 12" in width and over 0.188" in thickness. The corners or edges may be square or of other contours. (Fig. 1).

"DRAWN BAR"-Bar brought to final dimensions by cold drawing through a die, regardless of temper or prior operations.

"ROLLED BAR"—Bar brought to final thickness by rolling, with longitudinal edges those resulting from final rolling to thickness or by bringing to final width by shearing, slitting, sawing, machining, or rolling.

"DRAWN FLAT PRODUCT"—Flat product brought to final dimensions by drawing through a die, and furnished in flat straight lengths, on spools, or in rolls. The corners or edges may be square or of other contours shown in Fig. 1.



"DRAWN FLAT WIRE"—Drawn flat product up to and including 0.188" in thickness, and up to and including 1-1/4" in width, with all surfaces drawn without previously having been slit, sheared, or sawed. Drawn flat wire may be furnished either in straight lengths or on spools, reels or bucks.



"ROLLED FLAT PRODUCT"-Flat product brought to final thickness by rolling, and furnished in flat straight lenghts, on spools, or in rolls. Longitudinal edges may be those resulting from final rolling to thickness or the product may be brought to final width by shearing, slitting, sawing, machining or rolling. The corners or edges may be square or of other contours.

"ROLLED FLAT WIRE" - Rolled flat product up to and including 0.188" in thickness, and up to and including 1-1/4" in width, with all surfaces rolled without previously having been slit, sheared, or sawed. Rolled flat wire may be furnished either in straight lengths or on spools, reels or bucks.

"PLATE"-A flat rolled product over 3/16" in thickness and over 12" in width.

"ROD"-A round, hexagonal or octagonal solid section furnished in straight lengths.

"DRAWN ROD"—Rod brought to final dimensions by cold drawing through a die, regardless of temper or prior operations.

"EXTRUDED ROD"-Rod brought to final dimensions by extrusion.

"COLD ROLLED ROD"-Rod brought to final dimensions by cold rolling, regardless of prior operations.

"HOT ROLLED ROD"-Rod brought to final dimensions by hot rolling.

"TURNED ROD"-Rod brought to final dimensions by machining.

"SHAPE"-A solid section other than rectangular, square, or standard rod and wire sections, furnished in straight lengths.

"SHEET" - Flat rolled product up to and including 0.188" in thickness, and over 20" in width.

"STRIP"-A flat product, one with rectangular or square solid section, other than Flat Wire, up to and including 0.188" in thickness. The corners or edges may be square or of other contours.

"DRAWN STRIP"—A flat product brought to final dimensions by cold drawing through a die, in widths over 1-1/4" to 12" inclusive.





FLAT PRODUCTS

(Including all Rectangles and Squares)

(The classifications shown below are for specification purposes)

Furnished in Rolls or in Straight Lengths
Products with Slit,
Slit and Edge Rolled, Sheared,
Sawed or Machined Edges
Width (In Inches)

Over 20

Over 12

Up to 12

Thickness (In Inches)

incl.

to 20 incl. SHEET

STRIP

Up to .188 incl.

PLATE

BAR

Over .188

Products * with Drawn Edges or Rolled

	(Not Previously Slit) Edges	es
	Width (Width (In Inches)
Thickness	Up to	Over 1 1/4
(m menes)	incl.	12 incl.
Up to 188 incl.	FLAT WIRE	STRIP
Over .188	BAR	BAR

*The dimensional limits shown above for Bar do not apply to COPPER BUS BAR STOCK, which is a special product used for electrical purposes and is available in a greater range of sizes.

"ROLLED STRIP"—A flat product brought to final thickness by rolling, with longitudinal edges those resulting from final rolling to thickness or by bringing to final width by shearing, slitting, sawing, machining, or rolling, in widths up to 20" inclusive.

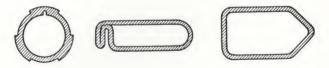
"TUBE"-A hollow product of round or any other cross section, having a continuous periphery.

"PIPE"—Seamless tube conforming to the particular dimensions commercially known as "Standard Pipe Sizes."

"SEAMLESS TUBE"-Tube produced with a continuous periphery at all stages of the operation in contrast to "brazed", "welded", "open seam" and "lock seam" tube.

"TUBULAR SHAPE"-Tube of non-uniform wall thickness or of irregular periphery or both.

Examples:



"MULTIPLE LENGTHS"—Lengths of integral multiples of a base length, with suitable allowance for cutting if and as specified. Several different multiples of the base length may be included in any lot, at the supplier's discretion.

"RANDOM LENGTHS'-Run-of-mill lengths without any indicated preferred length.

"SPECIFIC LENGTHS"-Indicated uniform lengths, subject to established length tolerances; for example: 12' - 0", 9' - 7", or 0' - 4-1/2" is a specific length.

"SPECIFIC LENGTHS WITH ENDS"—Indicated uniform lengths of 6 feet or over, subject to established length tolerances and with ends included according to established length schedules; for example, 10' - 0" with ends, or 6" - 5" with ends.



"STANDARD LENGTHS"—Lengths recommended in a Simplified Practice Recommendation, or established as a Commercial Standard, by the National Bureau of Standards, United States Department of Commerce, as the standard lengths for certain products. Products such as Copper and Red Brass, (Copper Alloy No. 230) Pipe, Copper Water Tube, Copper Threadless Pipe (TP), Copper Refrigeration and General Service Tube and Copper Drainage Tube (DWV) are furnished in standard lengths.

SIZE

In general, the length of any product regardless of form is specified in inches and fractions or in feet, inches and fractions. Width of plate, sheet and strip is also almost invariably specified in inches and fractions of inches. In the narrower strips decimals are sometimes used and are proper. Size of shapes, rod and tube is also normally specified in terms of inches and fractions.

Although gauge systems have been quite generally used in the past, this is not now considered good practice. It is strongly recommended that nominal dimensions, such as thicknesses of flat products, diameters of wire, etc. be specified in decimals of an inch rather than gauge numbers.

For large plates and frequently for other forms, weight is more important than actual dimensions and a weight per piece or per unit of length or of area is used in place of linear dimensions. This is quite proper, but it should be clearly stated so that no confusion results.

TOLERANCES

Since it is physically impossible to produce metal sections of precisely the dimensions specified, a reasonable tolerance or variation from the nominal is customarily allowed. Tolerances, developed by the Copper & Brass Research Association, have been adopted as industry standards. Where for any reason it appears essential to allow less variation than indicated by the standard tables, narrower tolerances frequently can be agreed upon but this should be clearly stated and understood at the time of placing the order. Such closer-than-commercial tolerances will as a rule call for an extra price and will probably not be stock items.



TEMPERS

Temper is the condition of the metal with regard to mechanical properties as determined by the degree of final anneal or the degree of cold work thereafter, or both.

(1) ANNEALED TEMPERS—Present practice is almost invariably to indicate degree of anneal in terms of grain size at least for all alloys having only alpha grains. The most commonly specified nominal annealed tempers in terms of grain size are as follows. The smaller grain sizes are relatively harder and the larger grain sizes relatively softer.

Nominal or Average Grain Size	Range of Commercial Variation
mm.	mm.
0.015	0.010 - 0.025
0.025	0.015 - 0.035
0.035	0.025 - 0.050
0.050	0.035 - 0.070
0.070	0.050 - 0.100
0.120	0.070 - 0.150

Certain alloys not composed entirely of alpha grains do not lend themselves to classification under the above listed tempers. For such, the terms "light anneal" and "soft anneal" are commonly used.

LIGHT ANNEAL is roughly equivalent to 0.025 mm. above.

SOFT ANNEAL is roughly equivalent to 0.070 mm. above.

CONDENSER TEMPER is a term heretofore much used for condenser tubes and usually signified a grain size of about $0.015-0.045~\mathrm{mm}$. The direct indication of grain size is now considered preferable.

(2) ROLLED TEMPERS—Rolled tempers of rolled flat products are commonly expressed by such terms as hard, quarter hard, etc., defined by mechanical properties per standard specifications, such as A.S.T.M. B36. The present tendency in the Mill is to refer to the degree of cold working directly in % reduction of thickness. The nominal % reduction must be adjusted to take into account the effect of different prior grain sizes and thicknesses on the particular alloy in process. Nominal % reductions for the standard tempers are contained in the following table:



Nominal Temper	Approximate Final % Reduction o Thickness by Rolling		
Eighth Hard	6		
Quarter Hard	11		
Half Hard	21		
Three-Quarter Hard	29		
Hard	37		
Extra Hard	50		
Spring	60		
Extra Spring	69		
Special Spring	75		

While the above % of thickness reductions apply to all common sizes of sheet, strip and plate, flat wire produced to the properties indicated by these nominal tempers requires slightly different thickness reductions depending on the width to thickness ratio, the amount of edge rolling and the final temper.

(3) DRAWN TEMPERS

(a) WIRE—In wire the most commonly used drawn tempers are the following, and either the names or the % reductions can properly be used. The tendency is towards direct indication in terms of % reduction.

Common Name	% Reduction of Area By Drawing
Eighth Hard	11
Quarter Hard	21
Half Hard	37
Hard	60
Extra Hard	75
Spring	84
Extra Spring	90
Special Spring	94
Rivet	Varies 5 - 21
Screw	About 15

(b) ROD AND BAR-For rod and drawn bar, the temper designations most commonly used are Half Hard and Hard. Less frequently used are Quarter Hard and Extra Hard. Considerable variation in actual reduction of area by drawing exists between the several alloys and nominal tempers as shown in the tabulation on GENERAL DATA Page 11.



(c) TUBE—For tube, three drawn tempers are recognized; namely, Drawn General Purpose, Hard, and Light Drawn. The Drawn General Purpose Temper is by far the most commonly used, since in the usual applications of tube, the only temper requirement is that the tube have a certain stiffness and rigidity. The precise degree of drawing and resulting mechanical properties are therefore not exacting. However, where the hardest feasible commercial temper is required, the nominal Hard is available and in the rare instance where a tube with some stiffness but yet capable of bending, flanging and beading is wanted, Light Drawn is obtainable. The definitions for these tempers are given in the table on GENERAL DATA Page 11.

ANNEALING

When it is necessary to anneal during fabricating operations, the temperatures necessary will vary considerably with the particular alloy used. Copper can be annealed at as low as about 600°F., and the highest temperature for any of the alloys listed is approximately 1400°F. The temperature actually used for any alloy will depend somewhat on the previous treatment and the characteristics desired, the lower temperatures producing relatively harder, stiffer and less ductile material than the higher temperatures. The best criterion of degree of anneal is grain size which quite accurately determines the properties in the annealed state for most of the alloys. In general the small grain sizes around 0.015 mm. would be used where an excellent surface and considerable stiffness are desired. Increased average or nominal grain sizes up to perhaps as high as 0.035 mm. for high copper alloys, or to 0.050 or even 0.070 mm. for yellow brasses might be required where the degree of working or the complexity of shape is increased.

During the fabrication of brass and copper articles it is sometimes necessary to anneal between operations, and the surface of the article acquires a coating of oxide which must be removed before the next operation can be performed.





ROD AND BAR TEMPER TERMINOLOGY

Product	Diameter or Thickness, In.	Nominal Te	Nominal Temper, % Reduction of Area by Drawing	Drawing
		Quarter	Half	
ROD		Hard	Hard	Hard
	(Up to 3/16	10	15-30	35*
Free-Cutting Brass	Over 3/16 to 3/4	10	15-30	35
Medium-Leaded Brass	Over 3/4 to 2	10	12-20	1
	Over 2	4-10	10-15	i
	Up to 2	10	20-35	1
Leaded Commercial Brass	Over 2	4-10	10-15	1
Naval Brass	All	1	Light Anneal	4-10
	(Up to 2 1/2	1	Light Anneal	12-20
Leaded Naval Brass	Over 2 1/2	ı	Light Anneal	4-12
	(Up to 1/4	ı	Light Anneal	20-30
Manganese Bronze (A)	Over 1/4	ı	Light Anneal	10-20
DKAWN BAK				
Free-Cutting Brass	All	I	7-20	1
Naval Brass	A11	ı	Light Anneal	4-9
*Rounds only.				
	TUBE TEMPE	TUBE TEMPER TERMINOLOGY		

ea by Drawing	Light	Drawn	10 (max. 20)	10 (max. 20)	10 (max. 20)
r % Reduction of A		Hard	50 (min. 40)	35 (min. 30)	I
Nominal Tempe	Drawn	General Purpose	50 (min. 18)	35 (min. 14)	10-35
		Size	Common Sizes	up to 4" O.D. Common Sizes	up to 4" O.D. Other Sizes

Alloy

Coppers

Coppers and Brasses



FINISHES OF BRASS MILL PRODUCTS

PLAIN PICKLED FINISH—The finish obtained by immersion in a 5 to 10% (by volume) sulphuric acid solution. This effectively removes most heavy scale and oxides on yellow brasses, but less effectively on other alloys and will not remove any thin surface films of deposited copper. The color is, therefore, usually duller than that of bright dipped or bichromate dipped material.

BICHROMATE (Dichromate) DIPPED FINISH—The finish obtained by immersion in a solution usually made by adding 1/4 to 1/2 pound of sodium bichromate to 1 gallon of 10% sulphuric acid solution. The action of this dip, which is always used following a plain pickle, substantially removes all remaining scale and oxides and produces a color that approaches the true color of the metal.

BRIGHT DIPPED FINISH—The finish obtained by immersion after a plain pickling in a suitable oxidizing acid solution (as, for instance, a solution of sulphuric acid, nitric acid, and water,) resulting in a complete removal of scale and oxide and giving the true color or approximately the true color of the metal.

COLD ROLLED FINISH—The finish obtained by cold rolling of plain pickled strip with a good metal lubricant and resulting in a smooth but relatively dull appearance as compared to that obtained by "Kerosene Rolled Finish" or "Dry Rolled Finish", which see.

KEROSENE ROLLED FINISH (Rolled and Fatty Soap-Water Emulsion Rolled)—The finish obtained by cold rolling with kerosene, soap or fatty soap-water emulsions which are all relatively cooler metal lubricants and resulting in a semi-burnished appearance.

DRY ROLLED FINISH (Bright Rolled Finish)—The finish obtained by cold rolling on polished rolls without the use of any coolant or metal lubricant, of material previously plain pickled, giving a burnished appearance.

ACID DIPPED-DRY ROLLED FINISH-The finish obtained by cold dry rolling on polished rolls of material previously bichromate dipped or bright dipped, giving a burnished appearance and retaining the color obtained by dipping.

HOT ROLLED FINISH (Left Black)—The finish obtained by rolling metal while hot, resulting in a dark oxidized and relatively rough surface.

Note: This material may subsequently be pickled, bichromate dipped, or bright dipped, but the relatively rough surface remains.



DRAWN FINISH—The finish obtained on tube, wire, and drawn rod, bar and strip by drawing through a die, resulting in a relatively smooth and bright appearance.

OXIDIZED FINISH-The finish obtained from annealing in an oxidizing atmosphere without resort to subsequent pickling or dipping.

EXTRUDED FINISH—The finish obtained on tube, wire, rod and bar by hot extrusion through a die, resulting in a slightly oxidized and dull appearance.

SCRATCH BRUSHED FINISH (Satin Finish)—The finish obtained by mechanically brushing the surface with wire bristle brushes or by buffing on a cloth wheel using greaseless compound.

POLISHED SURFACE (Buffed Surface)—The finish obtained by buffing with rouge or similar fine abrasive, resulting in a high gloss or polish. This may be applied in one operation or two, commonly known as cutting and coloring operations.

BRIGHT ANNEALED FINISH—The finish obtained by annealing copper or high copper alloys substantially free of zinc in such an atmosphere that no visible oxide or scale can form and the metal comes from the furnace as clean and bright as before annealing. Brasses or other zinc-bearing alloys annealed under similar conditions usually have a very light film but this film can be quickly and easily removed by a flash pickle.



FINISHES OF COPPER AND COPPER BASE ALLOY PRODUCTS

The following chemicals for pickling and dipping are dangerous and very corrosive and if one is not familiar with them and their action they should not be used. These mixtures rapidly remove scale and the tarnished surface of the metal so as to develop the natural fine color of the metal itself. The concentrations and compositions given are suggestive only and may be modified to suit particular requirements of surface finish.

Containers for the solutions given below can be as follows:

For solutions (a) and (b) stone crocks or lead lined tanks.

For solutions (c), (d) and (e) stone crocks only are recommended.

Great care should be taken in making up these solutions in the crocks as a great deal of heat is produced and cracking is liable to occur. Whenever possible the crock should be set into a tank or trough where water can be freely circulated around it.

All articles to be dip finished as described below should first be cleaned in such a way as to remove oil or other lubricants. This can be best done by using a good grade of metal cleaner. Cleaning solutions are usually made up by adding four ounces of the cleaner to one gallon of water and using it at approximately 180°F. After the cleaning process the articles should be thoroughly rinsed in two clear waters before placing in the pickle or dips.

(a) SULPHURIC ACID PICKLE

Add ten gallons of sulphuric acid (oil of vitriol) of 1.84 sp. gr. to 100 gallons of water.

(b) BICHROMATE DIP

Dissolve 5-1/2 pounds of sodium bichromate in 10 gallons of water. Then add 1-1/2 gallons of sulphuric acid (1.84 sp. gr.). Care should be taken to remove all scale and heavy oxides in (a) and leave the material in (b) only long enough to obtain a bright finish.

(c) SCALE OR FIRE-OFF DIP

Mix equal parts by volume of nitric acid (Aqua Fortis) of 1.33 sp. gr. and water.



(d) NITRIC-SULPHURIC ACID BRIGHT DIP

Place 35% water by volume in a container and carefully add 50% sulphuric acid. After solution has cooled sufficiently carefully add 15% of nitric acid. To this might also be added a small amount of common salt or hydrochloric acid (muriatic acid). Dissolve a few small pieces of brass scrap in the solution prior to regular use.

Articles may first be dipped in the scale or fire-off dip. This will depend on the surface of the article to be finished.

(e) MATTE DIP

Place a suitable size crock in a water tank and put 65% nitric acid by volume into the crock. Then carefully add 35% sulphuric acid. To this add enough zinc sulphate to make a super-saturated solution. Heat the water in the tank to about 180°F, and this in turn will sufficiently heat the dip. When the latter is hot use a wooden paddle to stir the solution and the zinc sulphate sludge. The dip is now ready and should be used as follows:

Dip the article in solution (c) (this is optional), then into (d). Rinse in running water, then hot water and dry in hot sawdust. Next dip into (e) until all action has ceased. Remove and dip in (d). Rinse well in cold water and dip in cyanide solution, (4 ounces sodium cyanide per gallon of water). Rinse in cold water, hot water and dry in hot sawdust. The texture of the matte can be governed by varying the proportions of sulphuric acid and nitric acid in (e). Increasing the amount of the vitriol gives a decidedly satin finish. Increasing the amount of nitric acid gives a coarse finish.

(f) BROWN-REDDISH BRONZE COLOR ON COPPER OR ALLOYS CONTAINING 85% OR OVER OF COPPER

The articles must be thoroughly cleaned and then the following solution may be used:

2 ounces potassium sulphuret (liver of sulphur)

3 ounces caustic soda

1 gallon water

Use solution hot, say at 160 to 180°F.

Tones develop on copper in the following order-brownish, reddish bronze. Remove when desired tone is reached and wash thoroughly.

Scouring with pumice and water or oil helps to bring out certain tones. Scratch brushing with a brass wire scratch brush is another means of developing additional tones.

(g) BROWN ON BRASS

Solution (1) 4 ounces copper sulphate

8 ounces potassium chlorate

1 gallon water



Solution (2) 1 ounce liquid sulphur or

2 ounces liver of sulphur

1 gallon water

First immerse the article in Solution (1) for approximately one minute, and without rinsing immerse in Solution (2) for a short time. The article should then be rinsed in cold water and the dipping operation repeated in both solutions until the desired color is obtained. Finally rinse the work in hot water, dry in hot sawdust or with an air blast, and scratch brush and lacquer.

(h) OLD ENGLISH FINISH ON BRASS

Solution (1) 1/2 ounce liquid sulphur or

1 ounce liver of sulphur

1 gallon water

Solution (2) 2 ounces copper sulphate

1 gallon water

Immerse the articles in Solution (1), and without rinsing immerse in Solution (2). Then rinse in cold water and repeat the dipping operations until a light color is produced. For a uniform finish scratch brush and then repeat the dipping operations first in Solution (1) and then Solution (2) until the desired color is obtained. Finally, rinse thoroughly in cold and hot waters, dry in sawdust, scratch brush on a fine wire wheel and lacquer.

(i) BLUE BLACK ON BRASS

Solution 1 pound copper carbonate

1 quart ammonium hydroxide

3 quarts water

Thoroughly mix the copper carbonate together with the ammonia and then add the water. Solution should be used at approximately 175°F. Immerse the work until the proper color is obtained, which should be in about one minute. Always have an excess of copper carbonate present.

LUBRICATION, PRESSWORK

For most forming, stamping and drawing operations on brass or copper, a 5% water solution of a good grade of soap chips will furnish an excellent lubricant. The solution should be kept slightly warm to prevent forming a gel. For more intricate operations, it is sometimes necessary to use a 3% water solution of a compound containing approximately 30% moisture, 50% free fats and 20% soap. Previous to the drawing operation, the strip can be completely submerged in the lubricant and drained, or the solution can be applied with a swab, or better still, applied by felt rollers which pick up the lubricant and distribute it evenly over the surface of the strip as fed to the press. Partly formed or drawn articles are immersed in the solution and allowed to drain before being redrawn.



To prevent red stains, it is good practice to wash the articles shortly after drawing. The lubricant can be removed by a commercial alkaline metal cleaner composed of caustic soda, soda ash, trisodium phosphate, sodium silicate and a wetting agent. A solution of 3 to 5 ounces of cleaner per gallon of water is used at approximately 180°F., after which the shells are thoroughly rinsed in cold and hot waters and dried.

LUBRICATION, MACHINING

Light machine oil, commonly known as paraffin oil, is a popular and satisfactory lubricant for cutting, drilling and tapping Free-Cutting Brass and other free-machining copper alloys. This is a mineral oil with a viscosity of about 100 seconds Saybolt at 100° F.

Some job shops use lard oil as a universal lubricant for brass, steel and aluminum. Modifications of mineral and lard oils, with additives, are available for high speed, high pressure work.

Water soluble oils in proportions of one part oil to 10 - 20 parts of water are popular for high speed cutting of free-machining alloys. Chemical type lubricants are also used in proportions of one part compound to 10 - 20 parts water where high heat dissipation is desired with moderate forming and tool pressures.

Since copper, the straight brasses and other non-leaded copper alloys have relatively low machinability ratings, they require modifications of the above lubricants, or other special compounds. The following are used for various applications and are commercially available.

- 1) Heavy duty soluble oils (light body mineral oil, an emulsifier and sulphur additive. The sulphur should be made non-staining by inhibitors.)
- 2) 75% to 90% paraffin oil mixed with 10% to 25% lard oil. Non-staining sulphur compounds can be added to this.

The oil base lubricants may be removed from the work by trichlorethylene in a vapor degreaser or by any of the alkaline metal cleaners described in the section on drawing and forming lubricants.



STAINLESS-AVAILABLE FORMS

Listed below are those types considered as standard grades by the American Iron and Steel Institute. Following are the product forms in which they are produced.

Type No.	Strip	Sheet	Plate	Bars	Wire	Extru- sions	Seamless Tubing and Pipe	Welded Tub- ing and Pipe
201	х	х		х		х	х	
202	x	x	x	x	х	x	x	
204	x(a)		x			x		
301	x	х	x(a)	х				
302	x	x	x	x	x	х	x	x
302B	x	x	x(a)	x	x	x		
303	x		x	x		x	x(a)	
303 Se	x(a)			x		x	x	
304	X	x	x	x	x	x	x	x
304L	x	x	x	x	x	x	x	x
305	x	x	x(a)	x	x	x	x	
308	x(a)	x(a)	x(a)	x	x	x	x	
309	X	X X	X	x	x	x	x	x
309S	x	x	x	x	x	x	x	x
309 SCB	Λ	Λ	^	Λ	^	A	Α	x
309 SCB		x	x	x	x	x	х	x
			x		x	x	X	x
310	Х	X	X	X	X	X	Δ.	
310S		()	()					х
314	х	x(a)	x(a)	X	X	Х	X	
316	х	X	Х	X	х	X	X	х
316L	X	Х	X	X	х	X	X	x
316F				X		X	X	
316 Se				X		X	x	
317	х	х	x(a)	х	x(a)	X	x(a)	x
318	x(a)	x(a)	x(a)	x(a)	x	x	X	
D319	х	x	X	X	x	X	X	
321	x	x	X	X	x	x	X	x
329								x
330								x
347	х	x	x	x	x	x	x	x
347 Se						x	X	
348	x	x	x(a)	x(a)	x	x	x	x
403	x(a)		x	x	x	x	X	
405	x	x	x	x	x	x	x	
410	x	x	x	x	x	х	x	
414		-	x(a)	x(a)	x	х	x(a)	
416			x(a)	X	-	x		
416 Se			11(00)	x		x	x	
418 Spl.				x	x	x	x(a)	
420	x	x(a)		x	x	x		
420 F	Δ.	n(u)		x	4	x		
420 Se				x		x		
420 56				x		x		
430	x	x	x	x	x	x	x	x(a)
		^			^			A(a)
430 F	х		х	X		X	x	
430 Se				X		X	X	
430 Ti	х	x	х	х	x	X	X Y(a)	
431	/ \			Х	X	Х	x(a)	
440A	x(a)			X		х	x(a)	
440B				X		х	x(a)	
440C				X		х	x(a)	-
440 F				X		х	x(a)	
440 Se				x		х	x(a)	
442	x	x	x(a)	x	x	х	X	x(a)
446	x	x	x(a)	x	x	x	x	

⁽a) Acceptable under certain conditions only.

THE STAINLESS TYPES

Group	Struc- ture	Harden- ability	Туре	Analyses Built up from Basic Types
Chromium- Nickel- Manganese			201 202 204 204L	Cr and Ni lower for more work hardening Basic Type—Cr 18%—Ni 5%—Mn 8% C lower to avoid carbide precipitation C lower for welding application
Chromium-Nickel	Austenitic	Hardenable by Cold Work	301 302 302B 303 Se 304 304L 305 308 309 309 CT 309S 310 314 316 Se 316F 316 Se 316F 317 318 321 347 347 Se 348	Cr and Ni lower for more work hardening Basic Type—Cr 18%—Ni 8% Si higher for more scaling resistance P and S added for easier machining Se added to improve machinability C lower to avoid carbide precipitation C lower for welding application Ni higher for less work hardening Cr and Ni higher with C low for more corrosion and scaling resistance Cr and Ni still higher for more corrosion and scaling resistance Cb, Ta added to avoid carbide precipitation C lower to avoid carbide precipitation C rand Ni highest to increase scaling resistance Si higher to increase scaling resistance Mo added for more corrosion resistance Se added for easier machining S added for easier machining C lower for welding application Mo higher for more corrosion resistance and greate: strength at high temperatures Cb, Ta added to avoid carbide precipitation Ti added to avoid carbide precipitation Cb, Ta added to avoid carbide precipitation Se added to improve machinability Similar to 347, but low tantalum content (.10)
	Ferritic	Non- hardenable	405 430 430 F 430 Ti 442 446	Al added to Cr 12% to prevent hardening Basic Type—Cr 17% P and S added for easier machining Titanium stabilized Cr higher to increase scaling resistance Cr much higher for improved scaling resistance
Chromium	Martensitic	Hardenable by Heat Treatment	403 410 414 416 Se 418 Spl 420 420 F 422 F 431 440 A 440 B 440 C 440 F 440 Se	Cr 12% adjusted for special mechanical properties Basic Type—Cr 12% Ni added to increase corrosion resistance and mechani cal properties P and S added for easier machining Se added to improve machinability W added to improve high temperature properties C higher for cutting purposes P and S added for easier machining V, W, Mo added to improve high temperature properties Cr higher and Ni added for better resistance and properties C higher for cutting applications C higher for cutting applications C still higher for wear resistance S added for easier machining Se added for easier machining

Abbreviations for Alloying Elements

Carbon	Nickel Ni Phosphorus P Selenium Se Silicon Si Sulfur S	Titanium Ti Tantalum Ta Tungsten
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COMPARATIVE PROPERTIES-STAINLESS STEEL

		M-NICKEL- E AUSTENITIC		M-NICKEL ENITIC
TYPE NUMBER	201	202	301	302
ANALYSES—PERCENT: Chromium Nickel Other elements (Note 6) Carbon Manganese Silicon	16.0-18.0 3.5-5.5 N .25 max, .15 max, 5.5/7.5 1.00 max,	17.00-19.00 4.00- 6.00 N .25 max. .15 max. 7.50-10.00 1.00 max	16.00-18.00 6.00- 8.00 	17,00-19.00 8.00-10.00
PHYSICAL DATA: Melting range—°F. Density—lb/in.³ Specific ht.—Btu/°F/lb(32-212 F) Therm. cond.—Btu/ft²/hr/°F/ft: 212 F. 932 F. Mean coeff. therm. expans.— in/in/°F x 10-6: 68-212 F. 68 to indicated temp.—°F.	0.28 0.12 9.4 	0.28 0.12 9.4 9 10.9 (1600)	2550-2590 0.29 0.12 9.4 12.4 9.2 11.0 (16.00)	2550-2590 0.29 0.12 9.4 12.4 9.2 11.0 (1600)
ELECTRICAL PROPERTIES: Mag. perm. at 200 H annealed Elec. resist.—microhm—cm: 68 F	1.02 max.	1.02 max. 69.0	1.02 72.0 116.0	1.02 72.0 116.0
HEAT RESISTANCE: Max. operating temp.—°F: Intermittent service(Note1) Continuous service	1500 1550	1500 1550	1600 1700	1600 1700
TEMPERATURES— working and treating—°F: Forging—start Forging—finish	2300 1700 1850-2000 WQ(AC) (Note 7)	2300 1700 1850-2000 WQ(AC) (Note 7)	2200 1700 1950-2050 WQ(AC) (Note 7)	2200 1700 1850-2050 WQ(AC) (Note 7)
MECH. PROPERTIES—annealed: Structure annealed	A 40,000 115,000 40.0 29.0 210 max B95 max 85 min	A 40,000 100,000 40.0 29.0 210 max B95 max 85 min	A 35,000 100,000 50.0 60.0 29.0 180 max B90 max 85 min	A 30,000 80,000 50.0 60 0 29.0 180 max B90 max 85 min
MECHANICAL PROPERTIES— heat treated: Yield strength—lb/in.² Ultimate strength—lb/in.² Elongation—% in 2 inches Hardness—Brinell Hardness—Rockwell	(Note 8)	(Note 8)	(Note 8)	(Note 8)
CREEP STGTHlb/in.2 at 1000 F: 1% Flow in 10,000 hr 1% Flow in 100,000 hr			19,000 13,000	19,000 13,000

For Notes, See Page 25, this Section.

COMPARATIVE PROPERTIES-STAINLESS STEEL

CHROMIUM-NICKEL AUSTENITIC

		AUSTI	ENITIC		
303	304	304L	305	309	310
17.00-19.00 8.00-10.00 S.1835 (Note 5)	18.00-20.00 8.00-12.00 	18.00-20.00 8.00-12.00 	17.00-19.00 10.00-13.00 	22.00-24.00 12.00-15.00 	24.00-26.0 19.00-22.0
2.00 max	2.00 max	2.00 max	2.00 max	2.00 max	2.00 max
1.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.50 max
2550-2590	2550-2650	2550-2650	2550-2650	2550-2650	2550-2650
0.29	0.29	0.29	0.29	0.29	0.29
0.12	0.12	0.12	0.12	0.12	0.12
9.4	9.4	9.4	9.0	9.0	8.0
12.4	12.4	12.4	12.4	10.8	10.8
9.2	9.2	9.2	9.2	8.7	8.0
11.0 (1600)	11.0 (1600)	11.0 (1600)	11.0 (1600)	10.9 (2100)	10.9 (2100
1.02	1.02	1.02	1.02	1.02	1.01
72.0	72.0	72.0	72.0	78.0	78.0
116.0	116.0	116.0	116.0	114.8	
1400	1600	1600	1600	1800	1900
1700	1700	1700	1700	2000	2100
2300	2200	2200	2200	2150	2150
1800	1700	1700	1700	1800	1800
1800-2000	1800-1950	1800-1950	1800-1950	2050-2150	2050-215
WQ	WQ(AC)	AC	WQ(AC)	WQ(AC)	WQ(AC)
(Note 7)	(Note 7)	(Note 7)	(Note 7)	(Note 7)	(Note 7)
A	A	A	A	A	A
30,000	30,000	25,000	30,000	30,000	30,000
75,000	80,000	70,000	75,000	75,000	75,000
40.0	50.0	40.0	50.0	40.0	40.0
50.0	60.0	60.0	60.0	50.0	50.0
29.0	29.0	29.0	29.0	29.0	30.0
160 min	180 max	180 max	180 max	200 max	180 max
B80 min	B90 min	B90 max	B90 max	B95 max	B90 max
60 min	85 min	80 min	85 min	80 min	80 min
(Note 8)	(Note 8)	(Note 8)	(Note 8)	(Note 8)	(Note 8)
19,000	19,000	19,000		22,000	32,000
13,000	13,000	13,000		12,000	17,000

For Notes, See Page 25, this Section

COMPARATIVE PROPERTIES-STAINLESS STEEL

CHROMIUM-NICKEL AUST ENITIC

		AUSIE	NITIC	
TYPE NUMBER	316	316L	317	321
ANALYSES—PERCENT: Chromium Nickel Other elements (Note 6). Carbon. Manganese Silicon	10.00-14.00 Mo 2.00-3.00 .10 max	16.00-18.00 10.00-14.00 Mo 2.00-3.00 .03 max 2.00 max 1.00 max	18.00-20.00 11.00-15.00 Mo 3.00-4.00 .10 max 2.00 max 1.00 max	17.00-19.00 9.00-12.00 Ti5 x C min .08 max 2.00 max 1.00 max
PHYSICAL DATA: Melting range—°F. Density—lb/in.³. Specific ht.—Btu/°F/lb(32-212 F). Therm. cond.—Btu/ft²/hr/°F/ft: 212 F. 932 F. Mean coeff. therm. expans.— in/in/°F x 10-8 68-212 F. 68 to indicated temp.—°F	2500-2550 0.29 0.12 9.4 12.4	2550-2650 0.29 0.12 9.4 12.4 9.2 10.7 (1600)	2500-2550 0,29 0,12 9,4 	2550-2600 0.29 0.12 9.3 12.8 9.2 10.7 (1600)
ELECTRICAL PROPERTIES: Mag. perm. at 200 H annealed Elec. resist.—Microhm—cm: 68 F	1.02 74.0 116.0	1.02 72.0 116.0	1.02	1.02
HEAT RESISTANCE: Max operating temp-°F: Intermittent service (Note 1) Continuous service	1600 1700	1600 1700	1600 1700	1600 1700
TEMPERATURES— working and treating—°F: Forging—start	2200 1700 1975-2150 WQ(AC) (Note 7)	2200 1700 1800-2000 AC (Note 7)	2200 1700 1975-2150 WQ(AC) (Note 7)	2200 1700 1800-2000 WQ(AC) (Note 7)
MECH. PROPERTIES—annealed Structure annealed Yield strength—lb/in.²—min Ultimate strength—lb/in.²—min Elongation—% in 2 inches—min	A 30,000 75,000 40.0 50.0 29.0 200 max B95 max 70 min	A 30,000 70,000 40.0 60.0 29.0 180 max B90 max 80 min	A 30,000 75,000 40.0 50.0 29.0 200 max B95 max 70 min	A 30,000 75,000 40.0 50.0 29.0 200 max B95 max 80 min
MECHANICAL PROPERTIES— heat treated: Yield strength—lb/in.² Ultimate strength—lb/in.² Elongation—% in 2 inches Hardness—Brinell Hardness—Rockwell	(Note 8)	(Note 8)	(Note 8)	(Note 8)
CREEP STRENGTH— Ib/in.* at 1000 F: 1% Flow in 10,000 hr	24,000 15,000	24,000 15,000	24,000 15,000	19,000 13,000

For Notes, See Page 25, this Section.

COMPARATIVE PROPERTIES-STAINLESS STEEL

	COMPARA	ATIVE PRO	PERTIES-ST	AINLESS STEE	
CHRO-NICKEL		CHROMIUM			MIUM
AUSTENITIC		FERRITIC		MARTE	
347	405	430	446	410	416
		14.00 10.00	22 22 27 20	11 50 12 50	12.00-14.00
17.00-19.00	11.50-14.50	14.00-18.00	23.00-27.00 .50 max	11.50-13.50 .50 max	.50 max
9.00-12.00	.50 max	.50 max	N .25 max	.50 max	5.1835 (Note 5)
Cb 10 x C min	A1 .1030	.12 max	.20 max	.15 max	.15 max
.08 max	.08 max 1.00 max	1.00 max	1.50 max	1.00 max	1.25 max
2.00 max	1.00 max	1.00 max	1.00 max	1.00 max	1.00 max
1.00 max	1.00 max	1.00 111411	1,00 max	2.00	
2550-2600	2700-2790	2600-2750	2550-2750	2700-2790	2700-2790
0,29	0.28	0.28	0.27	0.28	0.28
0.12	0.11	0.11	0.12	0.11	0.11
9,3			12.1	14.4	14.4
12.8			14.1	16.6	16.6
12.0	• • • • • •				
9.2	6.0	5.6	5.6	5.5	5.5
10.7 (1600)	6.2 (1600)	6.6 (1500)		6.4 (1300)	6.8 (1300)
1.02	Magnetic	Magnetic	Magnetic	Magnetic	Magnetic
73.0	61.0	60.0	67.0	57.0	57.0
			113.0	108.7	
1,000	1500	1600	2150	1500	1400
1600 1700	1500 1300	1500	2000	1300	1250
1700	1300	1000	2000	2000	
				0100	9999
2200	2100	2100	2150	2100	2200
1700	1600	1300	1600	1600	1600
1800-2000	1350-1500	1400-1500	1450-1600	1500-1650	1500-1650 SFC
WQ(AC)	AC	FC	WQ (Note 11)	SFC 1700-1850	1700-1800
(Note 7)	(Note 11)	(Note 11)	(Note 11)	O or A	O or A
				(Note 9)	(Note 9)
				(Note 10)	(Note 10)
A	F-C	F-C	F-C	F-C	F-C
30,000	32,000	35,000	45,000	32,000	32,000
80,000	60,000	60,000	75,000	60,000	60,000
40.0	20.0	20.0	20.0	20.0	20.0
50.0	50.0	40.0	40.0	50.0	50.0
29.0	29.0	29.0	29.0	29.0 200 max	29.0 200 max
200 max	180 max	200 max	200 max B95 max	B95 max	B95 max
B95 max	B90 max 25 min	B95 max 3-85	Low	85 min	
80 min	25 11111	3-00	Low	00	
(Note 8)				35,000-180,000	35,000-180,000
				60,000-200,000	60,000-200,000
				25-2	25-2
				120-400 P70 C45	120-400 B70-C45
				B70-C45	B10-C40
32,000		8500	6500	32,000	
27,000			4600	11,000	

COMPARATIVE PROPERTIES-STAINLESS STEEL

CHROMIUM MARTENSITIC

TYPE NUMBER	418 Spl.	420	422	431	440C
ANALYSES—PERCENT: Chromium	12.00-14.00 1.80- 2.20 W 2.50- 3.50	12,00-14.00 .50 max	11.50-13.00 .50- 1.00 V .30, W 1.00 Mo 1.00	15.00-17.00 1.25- 2.50	16.00-18.00 .50 max Mo .75 max
Carbon	.15 max .50 max .50 max	over .15 1.00 max 1.00 max	.2025 1.00 max 1.00 max	.20 max 1.00 max 1.00 max	.95-1.20 1.00 max 1.00 max
PHYSICAL DATA: Melting range-°F Density-lb/in.3	2650-2750 0.28	2650-2750 0.28	2650-2750 0,28	2550-2650 0.28	2500-2750 0,28
Specific ht.—Btu/°F/lb (32-212 F) Therm. cond.—Btu/ft²/hr/	0,11	0,11	0.11	0.11	0.11
°F/ft: 212 F	11.7	14.4		11.7	14.0
Mean coeff. therm. expans.— in/in/°F x 10 ⁻⁶				E E	E 0
68-212 F	5.3 6.5 (1300)	5.5 7.0 (1500)	6.7	5.5 6.5 (1050)	5.8 6.2 (1600)
ELECTRICAL PROPERTIES: Mag. perm. at 200 H an- nealed	Magnetic	Magnetic	Magnetic	Magnetic	Magnetic
Elec. resistMicrohm-cm:	61.7	55.0		72.0	60.0
1200 F					
HEAT RESISTANCE: Max operating temp-°F: Intermittent service (Note 1) Continuous service	1500 1300	1400 1200	1300	1600	1500 1400
TEMPERATURES— working and treating—°F: Forging—start. Forging—finish Annealing—ranges (Note 2) . Annealing—cooling (Note 3) . Hardening—ranges Quenching. Tempering—intermed. hardness Drawing—for relieving stresses.	2100 1600 1150-1250 FC 1750-1850 O or A (Note 9)	2100 1600 1550-1650 SFC 1850-1900 O or A (Note 9)	2100 1600 1150-1250 FC 1750-1900 O or A (Note 9) (Note 10)	2100 1500 1150-1225 FC 1750-1850 O or A (Note 9) (Note 10)	2100 1600 1550-1650 FC 1850-1900 O or A (Note 9)
MECH, PROPERTIES—an-					
nealed: Structure annealed Yield strength—lb/in.²—min . Ultimate strength—lb/in.²—	F-C 90,000	F-C 50,000	F-C 70,000	F-C 90,000	F-C 60,000
min Elongation—% in 2 inches— min	120,000	90,000	100,000	115,000	100,000
Reduction in area—%—min	45.0	40.0	45.0	45.0	35.0
lb/in.² x 106	29.0 310 max C33 max 50 min	29.0 240 max B100 max	29.0 260 max C27 max 50 min	29.0 290 max C31 max 40 min	30.0 260 max B105 max Low
MECHANICAL PROPERTIES -heat treated: Yield strength-lb/in.² Jitimate strength-lb/in.² archess-Brinell Jardness-Brinell	100,000-190,000 140,000-220,000 25-10 260-440 C27-45	50,000-220,000 90,000-270,000 15-2 180-550 B90-C55	110,000-190,000 140,000-240,000 25-15 275-475 C30-50	100,000-185,000 130,000-220,000 25-10 250-440 C24-45	(Note 4) 60,000-275,00 100,000-285,00 8-1 200-600 B95-C58
CREEP STRENGTH— lb/in.² at 1000 F: 1% Flow in 10,000 hr					

For Notes, See Page 25, this Section.



COMPARATIVE PROPERTIES-STAINLESS STEEL

NOTES

(Pages 20-24, this Section)

- For the austenitic steels, the optimum temperature for intermittent operation will depend largely upon the time cycle and will be lower than that listed for continuous service.
- 2. Flat rolled products in the chromium martensitic and chromium ferritic groups may be annealed at temperatures 50/100 F lower than those given, where scaling and pickling problems are of more consequence than fully annealed mechanical properties.
- Thin sections of the 200 and 300 Series, marked WQ(AC) are usually air cooled; heavy sections, water quenched.
- 4. Tensile properties of Types 440 A and C when fully hardened are not dependable and are not, therefore, included in the ranges given.
- 5. Easy machining grades will have P, S, or Se .07 min; Zr or Mo .60 max. Grades containing selenium are available for applications where the sulfur or phosphorus types are not suitable. They are designated by the letters Se after the type number. The properties listed apply for all the compositions of a given easy machining grade.
- 6. Where columbium is specified, a small amount of tantalum may be present.
- 7. Hardenable only by cold working.
- 8. In the case of the chromium-nickel types, mechanical properties higher than in the annealed condition are produced by cold rolling or cold drawing, and ultimate strengths up to 210,000 psi for small diameter bars can be obtained. Within those limits standard requirements of 1/4 hard, 1/2 hard, 3/4 hard and full hard are furnished.
- 9. Temper over 1100 F.
- 10. Draw under 700 F.
- 11. Non-hardening.
- 12. Condition SCT (850 F).
- 13. Condition H.
- 14. Treatment for billets or bars for reforging applications. A double treatment (1425 F + 1075 F, AC) is used on bars or forgings for best machinability.

Chemical Elements and Abbreviation used in the finder Chart.

Aluminum Al	Phosphorus P
Carbon	Selenium Se
Columbium Cb	Silicon Si
Chromium Cr	Sulfur S
Manganese Mn	Titanium Ti
Molybdenum Mo	Tungsten W
Nickel Ni	Vanadium V
Nitrogen N	Zirconium Zr

AC = Air Cool. FC = Furnace Cool.

SFC = Slow Furnace Cool.

WQ = Water Quench.

O = Oil Quench.
F = Ferrite.

C = Carbide.
A = Austenite.



FABRICATION PROPERTIES OF STAINLESS STEELS

Type Number	Readily joinable by fusion welding and adaptable to use in that form	Readily joinable by resistance welding and adaptable to use in that form	Readily joinable by soft and hard soldering	Readily heat-treatable for hardening and for me-	Readily formable by bending procedures and OK for use in that form	Readily shaped by deep drawing (cold) and adapt- able for use in that form	Physical and mechanical properties satisfactory for manual spinning (Better adapted than others)	Machinability (Adaptable to hot forging	Capable of being processed to various finishes
301 302 304 305 302 B 303 316 316 L 317 318 321 347 309 309 S 309 C 310 314										
410 403 414 416 418 Spec 420 420 F 431 440 A 440 C 440 F		MAF	CTENSI	FIC (Cr)	GROUP-	-HARDE	NABLE			
405 430 430 F 442 446		FER	RITIC (Cr) GRO		-HARDE	enable			



STAINLESS STEEL SPECIFICATIONS

U. S. Military Specifications

Specif	ication	Form	Neare		esponding Number		
specu	ication	FORM	SAE AISI AMS				
MIL-S-853A	Class 1, Types A, B, C		30304	304	5639		
(Ships)	Class 1, Types A, B, C		30302	302	5636A, 5637A		
Sup'sedes	Class 2, Types A, B, C Class 3, Types A, C, E, F	Bars	51410	410	5613C		
MIL-S-853	Class 4	and	51430	430	5627		
(Ships)	Class 5, Types A, F	Forgings,	51420	420	5620B, 5621		
(Ships)		except	51416	416	5610E		
	Class 6, Types A, C, E	for	30303F	303	5640E, 5641A, 5742		
	Class 7, Types A, B, C Class 8, Type A	reforging	30303 F	321 or	5645F, 5646D		
	Class 8, Type A	(For	30321 01	347	5645F, 5646D		
		reforging					
	Class 9, Types A, C	bars and	30317	317	-		
	Class 10, Types A, E, F	billets, see	51431	431	5628B		
	Class 11, Type A	MIL-S-862A)	30310	310	5651C		
	Class 12		30325	325	_		
	Class 14, Types A, E, F		-	_			
MIL-S-854 (Ships)	Class 1, Cond. A		30304	304	5513		
Amend 4	Class 2, Cond.	Diate	30302	302	5515C, 5516E, 5517D		
Sup'sedes	A, B, C, D, E Class 3, Cond. A	Plate,			5518C, 5519E		
47S20 (INT)	Class 3, Cond. A	Sheet,	51410	410	5504C		
(,	Class 4, Cond. A	Strip	51430	430	_		
	Class 8, Cond. A	and	30321 or	321 or	5510E, 5512B		
		Shapes	30347	347	<i>'</i>		
	Class 9, Cond. A		30316	316	5524B		
	Class 11, Cond. A		30310	310	5521B		
MIL-S-861A	Class 403		_	403	_		
(Ships)	Class 410		51410	410	5613C		
Sup'sedes	Class 405	Bars	-	406	-		
	Class 422		_	-			
MIL-S-861 (Ships)	Classes similar to	Bars and Billets					
MIL-S-862A			0.	- 3/11	G OFDA (Ghi)		
Sup'sedes	MIL-S-853A (Ships)	(For reforging	56	e MIL-	S-853A (Ships)		
MIL-S-862 (Ships)		only)	100001	001			
MIL-P-1144A	Comp. 304	Seamless	30304	304			
(Ships)	Comp. 316	and Welded	30316	316			
Used in lieu of	Comp. 321 or 347	Pipe	30321 or	321 or	_		
JAN-P-1144		•	30347	347			
MIL-S-4043		Plate, Sheet	-	304L	5511A		
(USAF) Amend 1		and Strip					
MIL-S-5059A	Comp. 301		30301	301	5515C, 5517D, 5518C		
(ASG) Amend 1		Plate, Sheet			5519E		
Sup'sedes	Comp. 302	and Strip	30302	302	5513, 5516E		
MIL-S-5059	Comp. 316		30316	316	5524B		
MIL-T-5695B (ASG)		Seamless &	30304	304	5560C, 5565C, 5566C		
Sup'sedes MIL-T-5695A		Welded Tubing					
MIL-W-6713	Grades G, Cond. A, B		30302	302	5688C		
Sup'sedes AN-W-24	Grades e, cona, 11, 2	Wire					
MIL-S-6721A	Comp. Ti.	Plate,	30321	321	5510E		
Sup'sedes	Comp. Cb.	Sheet and	30347	347	5512B		
	Comp. CbTa		30347	347	5512B		
MIL-S-6721 MIL-T-6737A	Comp. 347	Strip	30347	347	5575E		
	Comp. 347	Welded	30347	341	3373E		
(ASG) Amend 2			00001	0.01	FFRCA		
Sup'sedes	Comp. 321	Tubing	30321	321	5576A		
MIL-T-6737				201			
MIL-T-6845,		Seamless &	30304	304	5566C		
Amend 5		Welded Tubing-					
Sup'sedes AN-T-86		Hydraulic					
MIL-T-6846,		Seamless &	30304	304	5566C		
Amend 1		Welded Tubing-					
Sup'sedes AN-T-43		Hydraulic					
MIL-S-7720,	Comp. 302	Bars and	30302	302	5636A, 5637A, 5639		
Amend 1	Comp. 303S		30303F	303	5640E, 5641A, 5742		
Sup' sedes	Comp. 303 Se.	Forging	30303F	303 Se	5640E, 5641A, 5742		
AN-S-771	Comp. 316	Stock	30316	316	5648B, 5649		
MIL-T-8504 (ASG)		Seamless &	30304	304	5566C		
Amend 2		Welded Tubing-	00001	301			
Sup'sedes MIL-T-6846		Hydraulic					

Continued



STAINLESS STEEL SPECIFICATIONS

Continued

U.S.	MILITARY	SPECIFICATIONS	-	Continued	
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	U.S. MILITARY S	SPECIFICATIONS - 0	Continued					
Specia	fication	Form	Neare SAE	st Corre	esponding Number AMS			
MIL-T-8506 Amend 1		Seamless & Welded Tubing	30304	304	5560C, 5565C, 55660			
MIL-T-8606 (ASG)	Comp. G347	Seamless &	30347	347	5571A			
MIL-1-0000 (1100)	Comp. G321	Welded Tubing	30321	321	5570 F			
MIL-T-8808	Comp. G347	Seamless &	30347	347	5571A			
		Welded Tubing-						
	Comp. G321	Hydraulic	30321	321	5570 F			
MIL-S-17759	Cond. A, B, C, H	Bars, Billets,	_	17-10P	_			
(Ships)		Forgings & Wire						
MIL-S-17996	Class 1	Sheet and other	_	201				
(Ships)	Class 2	wrought forms	-	-	_			
MIL-T-18063	Comp. 304		30304	304	5560C, 5565C, 55660			
(Ships)	Comp. 304L	Seamless &		304 L	5647			
Amend 1	Comp. 347	Welded Pipe	30347	347	5570 F, 5575E			
(For radioactive		& Tubing						
systems service)			30304	304	5639			
MIL-S-18170	Comp. 304	Daniel Bandana	30304		5647			
(Ships)	Comp. 304L	Bars & Forgings,	_	304L	304 /			
Am end 3	C 245	except for	30347	347	5646D			
(For radioactive	Comp. 347	reforging	30341	341	00100			
systems service)	Comps, identical to				L			
MIL-S-18171	MIL-S-18170 (Ships)	Plate, Sheet &		See Mi	L-S-18170			
(Ships) (For radioactive	Amend 3	Strip			a) Amend 3			
systems service)	Amena 3	burp		(Dilip.	,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			
MIL-S-18732 (ASG)			51431	431	5628B			
Sup' sedes AN-QQ-S-770a.		Bars						
MIL-S-25043A (ASG)		Plate, Sheet &	-	17-7PH	5528, 5529			
MIL-D-2004011 (ADC)		Strip			· ·			
	AIR FORCE - NAVY A	ERONAUTICAL SPEC	IFICATIO	NS				
AN-W-24	Grade G	Wire	30302	302	5688C			
AN-S-757	Comp. Ti	Plate, Sheet	30321	321	5510E			
AN-5-151	Comp. Cb	& Strip	30347	347	5512B			
AN-QQ-S-770a, Amend 1	Comp. Co	Bars	51431	431	5628B			
AN-S-771,	Comp. G		30302	302	5636A, 5637A			
Amend 1	Comp. MCR	Bars	30316	316	5648B, 5649			
	Comp. FMS		30303F	303	5640E, 5641A, 5742			
	Comp. FMP		30303F	303	5640E, 5641A, 5742			
	Comp. FM Se		30303 F	303	5640E, 5641A, 5742			
AN-QQ-S-772a	Comp. G	Plate, Sheet &	30302	302	5515C, 5516E, 5517			
Amend 1		Strip			5518C, 5519E			
	Comp. MCR		30316	316	5524B			
AN-WW-T-855, Amend 2		Seamless Tubing	30304	304	5560C			
AN-WW-T-858,		Seamless	30321 or	321 or 347	5570 F 5571 A			
Amend 2		Tubing	30347	347	3371A			
		L SPECIFICATIONS						
QQ-W-423	Comp. FS 302		30302	302	5688C			
	Comp. FS 304		30304	304	5697			
	Comp. FS 310		30310	310	-			
	Comp. FS 316	Wire	30316	316	5690E			
	Comp. FS 410		51410	410	_			
	Comp. FS 420		51420	420	_			
	Comp. FS 430		51430	202				
QQ-S-763b	Class 202		30302	302	5636A, 5637A			
Sup'sedes QQ-S-00763a	Class 302 Class 303		30302 30303 F	302	5640E, 5641A, 5742			
Rev. 1 and MIL-S-854	Class 303 Class 303 Se		30303 F	303 Se				
(in part)			303031	304	5639			
	Class 304 Class 304L	_	-	304L	5647			
	Class 305	Bars,	30305	305	_			
	Class 309	Shapes	30309	309	5650			
	Class 310	and	30310	310	5651C			
	Class 316	Forgings	30316	316	5648B, 5649			
	Class 316L		_	316L	-			
	Class 317		30317	317	_			
	Class 321		30321	321	5645 F			
	Class 322		_	17-7PH				
	Class 324		1	17-4PH	15643C			

STAINLESS STEEL SPECIFICATIONS

Federal Specifications—Contined

2		_	Nearest Corresponding Number					
Specification	on	Form	SAE	AISI	AMS			
QQ-S-763b	Class 347		30347	347	5646D			
Sup'sedes QQ-S-00763a	Class 350		_	_	_			
Rev. 1 and MIL-S-854	Class 355			_				
(in part)	Class 403		_	403	_			
	Class 405		_	405	_			
	Class 410		51410	410	5613C			
	Class 414		51414	414	5615B			
	Class 416		51416	416	5610E			
	Class 416 Se	Bars,	-	416Se	5610E			
	Class 420	Shapes	51420	420	5620B, 5621			
	Class 430	and	51430	430	5627			
	Class 430F	Forgings	51430 F	430 F	_			
	Class 430 F Se		_	430 FSe	_			
	Class 431		51431	431	5628B			
	Class 440A		51440A	440A	5631			
	Class 440B		-	440B	_			
	Class 440C		51440C		5630C			
	Class 440 F		51440 F		5632A			
	Class 440 F Se		51440 F		5632A			
	Class 446		51446	446	_			
QQ-S-00766b	Class 201		_	201	_			
Amend 1	Class 202		_	202	_			
Sup'sedes MIL-S-854	Class 301		30301	301	_			
(in part)	Class 302		30302	302	5515C, 5516E, 5517D 5518C, 5519E			
	Class 304		30304	304	5513			
	Class 304L		_	304L	5511A			
	Class 305	Plate,	30305	305	5514A			
	Class 309	Sheet	30309	309	5523			
	Class 310	and	30310	310	5521B			
	Class 316	Strip	30316	316	5524B			
	Class 316L		-	316L				
	Class 321		30321	321	5510E			
	Class 323		-	_	_			
	Class 347		30347	347	5512B			
	Class 348		-	348	_			
	Class 410		51410	410	5504C			
	Class 430		51430	430				
	Class 446		51446	446				

STANDARD STAINLESS STEEL PROCESSING

Designation	Processing	Processing
SHEETS		BARS
No. 1	Hot rolled, annealed, pickled	Hot rolled
No. 2D	Dull cold rolled	Hot rolled and annealed
No. 2B	Bright cold rolled	Hot rolled, annealed, and pickled
No. 3	Intermediate polish, 100 grit finish	Heat treated
No. 4	Standard polish, 120 grit finish	Cold drawn
No. 6	Standard polish Tampico brushed, 180 grit	Centerless ground
	finish	Polished
No. 7	High luster polish, 320 grit finish	WIRE
STRIP		Cold drawn
No. 1	Cold rolled, annealed, pickled	Bright annealed
No. 2	Cold rolled, annealed, pickled, and re-	Annealed and cleaned
110. 2	rolled	Coated
PLATES		EXTRUSIONS, PIPE AND TUBING
	Hot rolled	Hot extruded
	Hot rolled and annealed	Cold drawn, annealed, and pickled
	Hot rolled, annealed, blast cleaned, or pickled	Heat treated or drawn to produce high mechanical properties
	Hot rolled, annealed, cleaned, and polished	Polished, OD and/or ID

GENERAL DATA 29.

Chase Stainless Steels CORROSION RESISTANCE TO VARIOUS MEDIA

CODE: a-Unaffected. b-Slightly attacked. c-Attacked. m-Complete details concerning the conditions of service should be submitted before selecting the grades for resistance to these media. Except where otherwise stated, all tests are conducted on cp materials, saturated solutions of salts, at room temperature.

	Tv	pe Nu	ımbe	rs		Ty	pe N	umbe	rs	
Medium		316			Medium		316			
ORGANIC SUBSTANCES					Arsenic (225 F)	b	• •	• •	• •	
Acetone	a	a	a	b	Arsenious	a	a	a	• •	
Alkaform anesthesia	a	a	С	С	Benzoic	a	a	a	a	
Benzol	a	a	a	a	Boric	m	a	m	• •	
Camphor	a	a	a	a	Butyric	a	a	a	• •	
Carbon disulfide	a	a			Carbolic	m	m	С	С	
Carbon tetrachloride	m	m	m	m	Chloracetic	a	a			
Carbon tetrachloride					Chlorosulfonic (conc.)	a	a	• •	С	
(vapors refluxed)	m	m	m	m	Chlorosulfonic (10%)	b	• •		С	
Coffee	a	a	a	a	Chromic (50%)	С	С			
Copal varnish	a	a	a	a	Chromic	С	С	С	c	
Ethyl alcohol	a	a	a	a	Citric	a	a		b	
Ethyl chloride	a	a	a	a	Cresylic	a	a			
Ethyl ether	a	a	a	a	Chromic (plus 10%					
Food pastes	a	a	a	a	potassium ferricyanide)				b	
Formaldehyde	m	m	m	m	Formic	С	m		c	
Fruit juices	a	a	a	a	Gallic	a	a	a		
Furfural	a	a			Hydrobromic	С	С			
Gasoline	a	a	a	a	Hydrocyanic	a	a	С	С	
Glue	m	m	m	m	Hydrochloric	С	С	С	c	
Ink	m	m	m	m	Hydrofluoric	С	С	c	С	
Iodoform dressing	С	a			Lactic	a	a	a	b	
Methyl alcohol	a	a	a	a	Lactic plus salt	m	m			
Methyl chloride	a	a			Malic	a	a		b	
Milk-fresh or sour	a	a	a	a	Molybdic	a	a			
Mustard	m	m	m	m	Nitric (conc.)	a	a	a	a	
Naphtha	a	a	a	a	Nitric (conc. plus 2%					
Oils-mineral and	-	-			HC1)	a		С	С	
vegetable	a	a	a	a	Nitrous (conc.)	a	a	a	b	
Paraffin (molten)	a	a	a	a	Oleic	a	a	a	a	
Paregoric cmpd	a	a		b	Oxalic	m	m	С	С	
Pine tar oil	a	a			Phosphoric	a	a	С		
Quinine bisulfate	b	a		c	Phosphoric (10%)	a	a	b	b	
Quinine sulfate	a	a		b	Picric (conc.)	a	a	a	a	
Rosin (molten)	a	a	a	a	Pyrogallic (conc.)	a	a	a	a	
Soaps	a	a	a	a	Pyroligneus (conc.)	a	a			
Sodium salicylate	a	a	a	a	Stearic (conc.)	a	a	a	a	
Soy bean oil	a	a			Succinic (molten)	С				
Tomato juice	m	m	m	m	Sulfuric (conc.)	a	a	С	С	
Trichlorethylene	m	m	m	m	Sulfuric (dil.)	m	m	c	c	
Tung oil	a	a			Sulfuric 15% (plus 2%			-		
Vinegar at 70 F	m	m	m	m	potassium dichromate)	a	a			
Vinegar (plus 0.5% salt,	111	111	111	111	Sulfurous (conc)	m	a	b	b	
200 F)	770	m	m	m	Tannic (conc.)	a	a	a	a	
200 F)	m	m	111	111	Tartaric (conc)	m	m	m	m	
ACIDS					Uric (conc.)	a	a	a	a	
ACIDS	200	200	222	220	or ic (conc.)	а	a	а	а	
Acetic	m	m	m	m	SALTS					
Acetic vapor	m	m	• •	С		200	220			
Arsenic (150 F)	a	a	• •	• •	Alum	m	m	• •	• •	

Chase Stainless Steels CORROSION RESISTANCE TO VARIOUS MEDIA

CODE: a—Unaffected. b—Slightly attacked. c—Attacked. m—Complete details concerning the conditions of service should be submitted before selecting the grades for resistance to these media. Except where otherwise stated, all tests are conducted on cp materials, saturated solutions of salts. at room temperature.

	Tv	pe N	umbe	ers		Ty	pe N	umbe	rs
Medium		316			Medium			430	
SALTS					Ferrous sulfate	a	a	a	a
Aluminum chloride	С			с	Ferric sulfate	a	a	a	
Aluminum fluoride	b	• •	• •	c	Glauber's salt	a	a		
Aluminum sulfate	a	a		b	Hydrogen peroxide	m	m	m	• • • • • • • • • • • • • • • • • • • •
Aluminum sulfate (sat.	а	а	• •	D	Lactic acid salts	a	a		
plus 1% sulfuric acid).	a	a		c	Lead acetate	a	a	a	
Aluminum sulfate (sat.	а	а	• •	C	Magnesium carbonate	a	a	a	a
plus 1% sodium car-					Magnesium chloride	m	m	c	c
bonate)	a	a		a	Magnesium sulfate	a	a	a	b
Ammonium alum	a	a	a		Magnesium hydroxide	a	a		a
Ammonium alum (sat.—	a	а	а	• •	Magnesium nitrate	a	a	a	
slightly ammonical)					Mercurous nitrate	a	a	a	a
200 F	a	a		С	Mercuric chloride	m	m	c	c
Ammonium bromide	m	a	b	b	Mercuric cyanide	a	a		b
Ammonium carbonate	a	a	a	a	Nickel nitrate	a	a	a	a
Ammonium chloride	m	m	b	b	Phosphorous trichloride	a	a		
Ammonium hydroxide	a	a	a	a	Potassium bromide	a	a		b
Ammonium monophos-	а	и	u		Potassium carbonate	a	a	a	a
phate	a	a			Potassium chloride	m	m	b	b
Ammonium nitrate	a	a	a	a	Potassium chlorate	a	a	a	
Ammonium oxalate	a	a		a	Potassium cyanide	a	a	a	a
Ammonium sulfate	a	a	a	b	Potassium dichromate .	a	a	a	a
Ammonium sulfate (plus	u	u			Potassium ferricyanide.	a	a	a	a
.05% sulfuric acid)	a	a		c	Potassium ferricyanide				
Barium carbonate	a	a			(boiling)	a	a		
Barium chloride	a	a		b	Potassium hypochlorite.	С	m	С	С
Barium hydrate	a	a			Potassium iodide	a	a		
Bleaching powder	m	m	С	c	Potassium iodide (sat.				
Bordeaux mixture	a	a			plus 0.1% sodium car-				
Calcium carbonate	a	a	a	a	bonate evaporated to				
Calcium chlorate	a	a			dryness)	a	a		b
Calcium chloride	m	m	С	С	Potassium hydrate	a	a	a	a
Calcium hypochlorite	c	m	c	c	Potassium nitrate	a	a	a	a
Calcium hypochlorite					Potassium oxalate	a	a	a	a
made alkaline with					Potassium permanganate	a	a	a	
NaOH	m	m			Potassium sulfate	a	a	a	a
Calcium hydroxide or					Silver bromide	a	a	a	a
oxide	a	a	a	a	Silver nitrate	a	a	a	a
Copper carbonate	a	a	a	a	Silver cyanide	a	a	a	
Copper chloride	С			С	Sodium acetate	a	a		
Copper cyanide	a	a	a	a	Sodium bicarbonate	a	a	a	
Copper nitrate	a	a	a	a	Sodium bichromate	a	a	a	
Copper sulfate (plus 2%					Sodium bisulfate	a	a		
sulfuric acid)	a	a		b	Sodium borate	a	a	a	
Copper sulfate	a	a	a		Sodium bromide	a	a		b
Creosote	c	m			Sodium carbonate (10%).	a	a	a	a
Creosote (plus 3% salt).	c				Sodium carbonate (50%).	a	a	a	
Ferric chloride (10%)	С	a	С	С	Sodium chlorate (10%)	a	a	a	
Ferric nitrate	a	a	a	a	Sodium chlorate (25%)	a	a	a	

Chase Stainless Steel CORROSION RESISTANCE TO VARIOUS MEDIA

CODE: a-Unaffected. b-Slightly attacked. c-Attacked. m-Complete details concerning the conditions of service should be submitted before selecting the grades for resistance to these media. Except where otherwise stated, all tests are conducted on cp materials, saturated solutions of salts, at room temperature.

	Tv	pe N	umbe	ers		Type Numbers				
Medium		316			Medium			430		
SALTS					Baking oven gases	a	a	a	a	
Sodium chloride	m	m			Beer	a	a	a	a	
Sodium chloride					Bromine	C	c	c	С	
(2% aerated)	a	a	b		Bromine water	C	С	c	С	
Sodium citrate	a	a	a	a	Cadmium (molten)	c	C			
Sodium fluoride	b				Carbonated beverages	a	a	a	a	
Sodium hydroxide	a	a	a	a	Chlorine (wet and dry) .	С	С	c	c	
Sodium hypochlorite					Cider	a	a	a	a	
(Dakin's solution)	m	m	С	c	Copper sulfate electro-					
Sodium hypochlorite					plating solution	a	a			
(satslightly alkaline)					Copper cyanide electro-					
(200 F)	a	a		b	plating solution	a	a			
Sodium lactate	a	a			Glycerin	a	a	a	a	
Sodium nitrate	a	a	a	a	Gold cyanide electro-					
Sodium nitrite	a	a			plating solution	a	a			
Sodium peroxide (212 F)	a	a			Hydrogen sulfide (400 F)	m	m			
Sodium phosphate	a	a			Iodine	c	m	С	С	
Sodium sulfate	a	a	a	a	Lead (molten)	С	С			
Sodium sulfide	a	a	a	a	Linseed oil	a	a		b	
Sodium sulfite	a	a	a	a	Lysol	m	m	С	С	
Sodium thiosulfate (plus					Meats	a	a			
4% potassium meta bi-					Mercury	a	a			
sulfate)	a	a	a	a	Mine water	m	m	m	m	
Sodium thiosulfate 20%					Nickel sulfate electro-					
plus acetic acid 20%	m	m	m	С	plating solution	a	a			
Soda ash (10%) (200 F) .	a	a	a	a	Sauerkraut brine	m	m			
Soda ash (50%) (200 F) .	a	a	a	a	Sea water	m	m		С	
Stannic chloride	c	c		c	Silver cyanide electro-					
Stannous chloride	b		c	c	plating solution	a	a			
Sulfur (molten) 500 F	a	a	a		Steam and air (refluxed)	a	a		b	
Sulfur chloride	b				Steam, CO, and air	a	a		b	
Titanium tetrachloride .	a		• • •		Steam, SO, CO, and air.	b	m	b	b	
Zinc chloride	c	b		c	Sulfur dioxide	m	m			
Zinc sulfate	a	a	a	a	Syrup	a	a	• • •		
Zilic sulfate	а	а	a	а	Vegetable juices	a	a	a	a	
MISCELLANEOUS					Water	a	a	a	a	
	С	С	С		X-ray developing solution	m	m	a		
Aluminum (molten) Ammonia	a	a	a	• •	Zinc (molten)	C	c	c	c	
Ammonia	a	a	a	• •	Zuic (morten)	-	C	-	C	





CURRENT MATERIAL SPECIFICATIONS BRASS & BRONZE

			BRASSI	ES			
Material	Copper Alloy No.	Brass & Bronze Page	A.S.T.M.	A.M.S.	S.A.E.	Federal	Military
Gilding, 95% Sheet & Strip	210	41	B36 Alloy 1				JAN-G-439
Commer. Bronze, 90% Sheet & Strip	220	41	B36 Alloy 2; B130				JAN-G-383
Commer. Bronze, 90% Tube	220	61	B135 Alloy 7				MIL-B-2029 Class B
Jewelry Bronze, 87.5% Wire	226	88		No A	pplicabl	e Specificatio	ns
Red Brass, 85% Sheet	230	39	B36 Alloy 3		79A	QQ-B-613b Comp. 4	
Red Brass, 85% Tube	230	59	B111 B135 Alloy 1		74D	WW-T-791 Grade 1	
Red Brass, 85% Pipe	230	68	B43				MIL-T- 20168A
Low Brass, 80% Wire	240	85	B134 Alloy 4			QQ-W-321c Comp. 4	
Cartridge Brass, 70% Sheet & Strip	260	25	B36 Alloy 6	4505D 4507C	70A & B	QQ-B-613b Comp.2&11	MIL-C-895A (Navy)
Cartridge Brass, 70% Tube	260	55	B135 Alloy 2	4555C	74C		MIL-T-6945 Comp. II
Cartridge Brass, 70% Wire	260	85	B134 Alloy 6				
Yellow Brass, 65% Wire	270	84	B134 Alloy 7	4713A 4712A	80B	QQ-W-321c Comp. 7	
Muntz Metal Sheet	280	37				QQ-B-613b Comp. 11	MIL-C-895A
		LEAD	-BEARING	BRASS	ES		
Leaded Comm'l Bronze Rod	314	11	B140 Alloy B				
Low Leaded Brass Tube	330	58	B135 Alloy 3	4555C	74B	WW-T-791 Grades 2&3	MIL-B-13492 (Ord) Comp. I MIL-T-6945 Comp. III
High-Leaded Brass Tube	332	61	B135 Alloy 4	4558B			MIL-B-13492 (Ord) Comp. 3
High-Leaded Brass Sheet & Strip	342	35	B121 Alloy 5			QQ-B-613b Comp. 24	MIL-C-895A (Navy)
High-Leaded Brass Sheet & Strip	353	35	B121 Alloy 4			QQ-B-613b Comp. 11	MIL-C-895A (Navy)
Free-Cutting Brass Rod	360	3	B16	4610H		QQ-B-626b Comp.22&11 Half Hard	MIL-C-895A



CURRENT MATERIAL SPECIFICATIONS BRASS & BRONZE

SPECIAL BRASSES

		SI	PECIAL BE	ASSES				
Material	Copper Alloy No.	Brass & Bronze Page	A.S.T.M.	A.M.S.	S.A.E.	Federal	Military	
Antimonial Admir- alty Type C Cond. Tube	444	64	B111 Type C			WW-T-756c Amend. #1	MIL-T-2794	
Phosphorized Ad- miralty Type D Cond. Tube	445	64	B111 Type D			WW-T-756c Amend. #1	MIL-T-2794	
Naval Brass Rod	464	9	B21 Alloy A	4611C 4612D	73	QQ-B-637 Comp. 1	MIL-B-994C (Ships) Comp. A	
Naval Brass Sheet	464	35	B171			QQ-B-613b Comp. 11 QQ-B-639	MIL-B-944C MIL-C-895A	
Leaded Naval Brass Rod	485 6 B21 QQ-B-637 Comp. 3		MIL-C-895A					
Inhibited Alum. Brass Cond. Tube	687	64	B111 Type B				MIL-T-16992a (Ships) Amend. I	
			TIN BRO	NZES				
Phos. Bronze, 5% A Rod	510	17	B139 Alloy A	4625D	81	QQ-B-750 Comp. A	MIL-B-892 (Ships) Amend. # 1	
Phos. Bronze, 5% A Strip	510	45	B103 Alloy A	4510C	77A	QQ-B-750 Type A	MIL-W- 16602	
Phos. Bronze, 5% A Wire	510	91	B159 Alloy A	4720B	81	QQ-W-401 Amend. #5	MIL-W-16602 (BuOrd)	
Leaded Phos. Bronze Grade B Rod	534	17	B139 Alloy B1					
#444 Bronze Rod	544	14	B139 Alloy B2		791	QQ-C-750 Comp. B		
			PER-NICK	EL ALL	OYS	T	MIL-T-15005D	
Cupro-Nickel, 30% Cond. Tube	715	64	B111				(Ships)	
Nickel Silver, 18% Sheet	752	47	B112 #2					
			SILICON B	RONZES	1	T = = = = = = = = = = = = = = = = = = =	0 1851	
Olympic Bronze, B Wire	651	88	B99 Alloy B			QQ-C-591c Alloy No. 651		
Olympic Bronze, A Sheet	655	47	B96, Type A B97, Alloy A B100, Alloy 2		-	QQ-C-591c Comp. A	MIL-C-17516 (Navy) Comp. 1	
		ENG	GINEERING	ALLO	YS			
Silnic Bronze Rod	647	14		No A	pplicab	le Specificatio	ons	



CURRENT MATERIAL SPECIFICATIONS COPPERS

			COI	1 1-1			
Material	Copper Alloy No.	Copper Page	A.S.T.M.	A.M.S.	S.A.E.	Federal	Military
Electro. Tough Pitch Rod & Bar	110	3	B187, B124 Alloy 12			QQ-C-5026 Amend. #4	MIL-C-12166 (Ord)
Electro. Tough Pitch Sheet & Strip	110	14	B152 Type ETP	4500D	71	QQ-C-576a	
Electro. Tough Pitch Wire	110	59	B1,B2,B3	4701B	83	QQ-W-341a Amend. #2	MIL-W-508b
Low Phos. Copper Tube Pipe	120	41	B188 Type DLP B75 Type DLP B280 Type DLP		75	WW-T-797	MIL-T-873a (Ships) Amend. #2
High Phos. Copper Tube	122	28	B68 Type DHP B75 Type DHP B88; B111 B280 Type DHP B302;B306		75	WW-T-00797b (Navy-Ships)	MIL-T-873a (Ships) Amend. #2; MIL-T-3235 Amend. #1
High Phos. Copper Refrig. Tube	122	36	B280 Type DHP B68 Type DHP B75 Type DHP	0	75	WW-T-799a Amend. #1	
High Phos. Copper ACR Tube	122	38	B75 Type DHP		75	WW-T-799a Amend, #1	
Copper Water Tube		32	B88*		75*	WW-T-799a* Amend. #1	
Tellurium Copper Rod	145	7	B301				
Beryll, Copper Strip	172	19	B194	4530B 4532A		QQ-C-533	MIL-C-6942

^{*}Except minimum copper content.

ALUMINUM SPECIFICATIONS

For Aluminum Rod, Bar & Wire Specifications, See Aluminum Page 18

For Aluminum Sheet & Plate Specifications, See Aluminum Pages 37-39

STAINLESS STEEL SPECIFICATIONS

For Stainless Steel Specifications, See Pages 27-29 this Section, and Page 42, Stainless Section (For Tubes).



MISCELLANEOUS DATA

RULES RELATIVE TO THE CIRCLE AND SQUARE

Circle

	Factor	Log Factor
To Find Area of a Circle: Multiply the sq. of the radius by Or multiply the sq. of the circumference by	3.142 0.07957	0.49715 2.90075
To Find Circumference of a Circle: Multiply the radius by	6.283 3.545	0.79818 0.54962
To Find Diameter of a Circle: Multiply the circumference by	0.3183 1.128	1.50284 0.05246
To Find Radius of a Circle: Multiply the circumference by	0.1592 0.5642	1.20194 1.75143
To Find Side of Square of Equal Area: Multiply diameter by	0.8862 0.2821 1.000	1.94753 1.45040 0.00000
To Find Side of Pentagon of Equal Area: Multiply diameter by	0.6756 0.2151 0.7624	1.82969 1.33264 1.88218
To Find Side of Hexagon of Equal Area: Multiply diameter by	0.5498 0.1750 0.6204	1.74020 1.24304 1.79267
To Find Side of Octagon of Equal Area; Multiply diameter by	0.4033 0.1284 0.4551	1.60563 1.10857 1.65811
Square		
To Find Area of a Square: Multiply square of distance across opposite corners by	0.5000 1.273	1.69897 0.10490
To Find Side or Distance Across Flats: Multiply distance across opposite corners by	0.707	1.84948
To Find Distance Across Opposite Corners: Multiply sq. root of area by	1.414 1.414	0.15051 0.15051
To Find Diameter of Equivalent Round Tube (equal circumference): Multiply diameter across flats by	1.276	



MISCELLANEOUS DATA

RULES RELATIVE TO THE HEXAGON AND OCTAGON

Regular Hexagon

Kegoldi Hexagoli		
		Log
	Factor	Factor
To Find Area of Hexagon:		
Multiply square of one side by	2.598	0.41466
Or multiply square of distance across flats by	0.8660	1.93752
Or multiply square of distance across opposite corners by	0.6495	1.81258
To Find Side of Hexagon:		
Multiply distance across flats by	0.5773	1.76140
Or multiply distance across opposite corners by	0.5000	1.69897
Or multiply sq. root of area by	0.6204	1.79267
To Find Distance Across Flats:	4 700	0.00050
Multiply length of one side by	1.732	0.23858
Or multiply distance across opposite corners by	0.8660 1.075	1.93752 0.03125
Or multiply sq. root of area by	1.075	0.03125
To Find Distance Across Opposite Corners:	2 000	0.30103
Multiply length of one side by	2.000 1.155	0.06247
Or multiply distance across flats by	1.241	0.00241
Or multiply sq. root of area by	1.211	0.00010
To Find Diameter of Equivalent Round Tube (equal circumference):	1.103	
Multiply diameter across flats by	1.103	
Regular Octagon		
To Find Area of Octagon:		
Multiply square of one side by	4.828	0.68381
Or multiply square of distance across flats by	0.8284	1.91824
Or multiply square of distance across opposite corners by	0.7071	1.84948
To Find Side of Octagon:		
Multiply distance across flats by	0.4142	61721
Or multiply distance across opposite corners by	0.3827	1.58286
Or multiply sq. root of area by	0.4551	1.65811
To Find Distance Across Flats:	2.414	0.38278
Multiply length of one side by	0.9239	1.96562
Or multiply distance across opposite corners by	1.099	0.04088
Of multiply sq. 100t of area by		
To Find Distance Across Opposite Corners: Multiply length of one side by	2.613	0.41716
Or multiply distance across flats by	1.082	0.03439
Or multiply sq. root of area by	1.189	0.07525
To Find Diameter of Equivalent Round Tube (equal circumference):	1 055	
Multiply diameter across flats by	1.055	



MISCELLANEOUS DATA

RULES RELATIVE TO THE PENTAGON, RECTANGLE AND TRIANGLE AND AREA CONVERSION

Regular Pentagon

		Log
	Factor	Factor
To Find Area of Pentagon:		
Multiply square of one side by	1.720	0.23566
Or multiply square of distance from center to any side by	3.633	0.56025
Or multiply square of distance from center to any corner by	2.378	0.37616
To Find Side of Pentagon:		
Multiply distance from center to any side by	1.453	0.16230
Or multiply distance from center to any corner by	1.176	0.07026
Or multiply sq. root of area by	0.7624	1.88218
To Find Distance from Center to any Side:		
Multiply length of one side by	0.6882	1.83771
Or multiply distance from center to any corner by	0.8090	1.90795
Or multiply sq. root of area by	0.5347	1.71991
To Find Distance from Center to any Corner:		
Multiply length of one side by	0.8506	1.92973
Or multiply distance from center to any side by	1.236	0.09206
Or multiply sq. root of area by	0.6485	1.81191
Regular Rectangle		
To Find Diameter of Equivalent Round Tube (equal circumference):		
Multiply height plus width by	0.637	
and the part of the terms of th		
Equilateral Triangle		
To Find Diameter of Equivalent Round Tube (equal circumference):		
Multiply altitude by	1.103	

AREA

To convert	Multiply by
Square inchesto Square mils1Square milsto Square inchesSquare inchesto Circular mils1Circular milsto Square inches	.000001
Square mils to Circular mils Circular mils to Square mils Circular mils to Square millimeters Square millimeters to Circular mils	1,2732 .7854 .0005066 1,973.51
Square inches to Square millimeters	645.16
Square millimeters to Square inches Square centimeters	.00155 6.4516 .155
Square feet to Square meters	.0929 10.764 .8361 1.196



MISCELLANEOUS DATA

CONVERSION FACTORS

LENGTH

To convert	Multiply by
Inches to Mils. Mils to Inches Inches to Millimeters. Millimeters to Inches	1,000. .001 25.4 .03937
Mils to Millimeters Millimeters to Mils Inches to Centimeters Centimeters to Inches	.0254 39.3701 2.54 .3937
Inches to Meters Meters to Inches Feet to Centimeters Centimeters to Feet	.0254 39.3701 30.48 .03281
Feet to Meters Meters to Feet Yards to Centimeters Centimeters to Yards.	.3048 3.2808 91.44 .01094
Yards to Meters Meters to Yards. Yards to Kilometers Kilometers to Yards.	.9144 1.0936 .0009144 1,093.6
Milesto MetersMetersto MilesMilesto KilometersKilometersto Miles	1,609.34 .0006 1.60932 .621414

VOLUME

To convert	Multiply by
Cubic inches to Cubic centimeters Cubic centimeters	16.3862 .06103 .01639 61.024
Cubic feet to Liters Liters to Cubic feet U.S. Bushels to Bushels (English) Bushels (English) to U.S. Bushels	28.317 .03531 .9688 1.032
Cubic inches to U.S. Bushels U.S. Bushels to Cubic inches Cubic feet to U.S. Bushels U.S. Bushels to Cubic feet	.000465 2,150.4 .8035 1.244
Liters	.02838 35.24 .8336 1.1997
Cubic inches to U.S. Gallons U.S. Gallons to Cubic inches Cubic feet to U.S. Gallons	.00433 230.98 7.482
U.S. Gallons to Cubic feet	.1336 .2642 3.785



MISCELLANEOUS DATA

TEMPERATURE

Fahrenheit = Centigrade x 1.8 + 32 Centigrade = (Fahrenheit - 32) ÷ 1.8

WEIGHTS, MELTING POINTS AND CONDUCTIVITIES OF METALS

Metal	Specific	Pounds	Melting	Electrical Conductivity (Copper =	
	Gravity	Cubic in.	°C	°F	100)
		111.	· ·	-	
Aluminum	2.708	.097	658	1,217	61
Antimony	6.618	.239	630	1,166	4.1
Bismuth	9.8	.353	271	520	1.5
Cadmium	8.55	.308	321	610	22.7
Copper (Annealed)	8.89	.321	1,083	1,981	100.0
Gold	19.33	.696	1,063	1,945	70.7
Iron	7.86	.284	1,530	2,786	17.2
Lead	11.37	.411	327	621	8.5
Lithium	.592	.0214	186	366	20.1
Magnesium	1.74	.0627	651	1,204	37.5
Mercury	14.38	.518	-38.87	-37.97	1.8
Nickel	8.90	.320	1,452	2,646	22.1
Platinum	21.50	.775	1.755	3,191	17.2
Potassium	.863	.0311	62	144	25.4
Silver	10.50	.378	960	1,761	105.8
Sodium	.978	.0352	97	207	35.1
Tantalum	16.6	.599	2,900	5,250	11.1
Tin	7.29	.263	232	449	15.0
Tungsten	19.30	.696	3,400	6,152	31.3
Zinc	7.10	.256	419	787	27.8

WEIGHT OF ICE

57 pounds per cu. ft.

.033 pounds per cu. in.

Decimals	and	Equivalents
in	Frac	tions

Comparison of Gauge Systems

	in Fractions		Amer-	Bir-				
			ican		Wash-			United
Decimal			or	ham	burn	Im-	London	
Equiv.		Gauge	Brown &	or	and	perial	or Old	Stan-
Inches	Fractions	No.	Sharpe	Stubs	Moen	S.W.G.	English	dard
						.500		.5000
.0156	1/64	7/0	F000		.4900	.464		.4688
.0312	1/32	6/0 5/0	.5800		.4305	.432		.4375
.0469	3/64	4/0	.5165 .4600	.454	.3938	.400	.454	.4063
.0625		3/0	.4096	.425	.3625	.372	.425	.3750
.0781	5/64 3/32	2/0	.3648	.380	.3310	.348	.380	.3438
.1094	7/64	2,0	.0010	.000	,0010	.0.10		
.1250	1/8	0	.3249	.340	.3065	.324	.340	.3125
.1406	9/64	1	.2893	.300	.2830	.300	.300	.2813
.1562	5/32	2	.2576	.284	.2625	.276	.284	.2656
.1719	11/64	3	.2294	.259	.2437	.252	.259	.2500
.1875	3/16	4	.2043	.238	.2253	.232	.238	.2344
.2031	13/64	5	.1819	.220	.2070	.212	.220	.2188
.2187	7/32							
.2344	15/64	6	.1620	.203	.1920	.192	.203	.2031
.2500	1/4	7	.1443	.180	.1770	.176	.180	.1875
.2656	17/64	8	.1285	.165	.1620	.160	.165	.1719
.2812	9/32	9	.1144	.148	.1483	.144	.148	.1563
.2969	19/64	10	.1019	.134	.1350	.128	.134	.1406
.3125	5/16	11	.0907	.120	.1205	.116	.120	.1250
.3281	21/64	10	0000	100	1055	104	100	.1094
.3437	11/32	12	.0808	.109	.1055	.104	.109	
.3594	23/64	13	.0720	.095	.0915	.092	.095	.0938
.3750	3/8	14	.0641	.083	.0800	.080	.083	.0730
.3906	25/64	15		.072	.0720	.072	.065	.0625
.4062	13/32	16 17	.0508	.065	.0540	.056	.058	.0563
.4219	27/64 7/16	11	.0403	.000	.0340	.000	.000	.0000
.4375 .4531	29/64	18	.0403	.049	.0475	.048	.049	.0500
.4687	15/32	19	.0359	.042	.0410	.040	.040	.0438
.4844	31/64	20	.0320	.035	.0348	.036	.035	.0375
.5000	1/2	21	.0285	.032	.0317	.032	.0315	.0344
.5156	33/64	22	.0254	.028	.0286	.028	.0295	.0313
.5312	17/32	23	.0226	.025	.0258	.024	.0270	.0281
.5469	35/64		**					
.5625	9/16	24	.0201	.022	.0230	.022	.0250	.0250
.5781	37/64	25	.0179	.020	.0204	.020	.0230	.0219
.5937	19/32	26	.0159	.018	.0181	.018	.0205	.0188
.6094	39/64	27	.0142	.016	.0173	.0164	.0188	.0172
.6250	5/8	28	.0126	.014	.0162	.0148	.0165	.0156
.6406	41/64	29	.0113	.013	.0150	.0136	.0155	.0141
.6562	21/32	30	.0100	.012	.0140	.0124	.0138	.0125
.6719	43/64	31	.0089	.010	.0132	.0116	.0123	.0109
.6875	11/16	32	.0080	.009	.0128	.0108	.0113	.0102
.7031	45/64	33	.0071	.008	.0118	.0100	.0103	.0094
.7187	23/32	34	.0063	.007	.0104	.0092	.0095	.0086
.7344	47/64	35	.0056	.005	.0095	.0084	.0090	.0078
.7500	40/64	36	.0050	.004	.0090	.0076	.0075	.0070
.7656	49/64	37	.0030	.004	.0085	.0068	.0065	.0066
.7812	51/64	38	.0040		.0080	.0060	.0058	.0063
.7969 .8125	13/16	39	.0035		.0075	.0052	.0050	
.8125	53/64	40	.0033	1	.0070	.0032	.0045	
.8437	27/32							
.8594	55/64	41	.0028		.0066	.0044		
.8750	7/8	42	.0025		.0062	.0040		
.8906	57/64	43	.0022		.0060	.0036		
.9062	29/32	44	.0020		.0058	.0032		
.9219	59/64	45	.0018		.0055	.0028		
.9375	15/16	46	.0016		.0052	.0024		
.9531	61/64	47	.0014		.0050	.0020		
.9687	31/32	48	.0012		.0048	.0016		
.9844	63/64	49	.0011		.0046	.0012		
1.0000	1	50	.0010		.0044	.0010		



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